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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. VII APRIL, 1936 No. 2

SEX, AGE AND INDIVIDUAL VARIATION OF WINTER TREE SPARROWS

By A. MARGUERITE HEYDWEILLER

FOR the serious bird-bander, a student of the habits and component elements of the flocks about his feeding station, the brief descriptive phrase for the Tree Sparrow "Adult, sexes alike" is most inadequate. With the hope of finding positive external criteria for male and female, and for adult and first-year birds of each sex, a large number of specimens was collected in the fall of 1934, when skulls of the young were incompletely ossified and age as well as sex could be checked by dissection.

Skulls were found a reliable character until the first week in January. At the same time it was noted that immature males regularly showed smaller, whiter testes than the adults. On January 16th two of the eight males with small testes displayed skulls fully ossified, and thereafter this latter character had to be abandoned, though a trace of unossification was found as late as February 2d. Small testes were a reliable criterion of age until about the middle of March. Female gonads displayed no age differences on the wintering grounds, so that after January no females could be considered in age studies.

The relative values of various external characters were tested in 129 specimens taken from one locality near Ithaca, New York, between October 29th and January 3d. About a dozen a week were brought into the laboratory and arranged tentatively in four groups (presumably male adult, male immature, female adult, and female immature) on the basis of plumage characters. Next they were weighed and measured, and, if necessary, the groups were rearranged. Finally they were dissected for positive identification. On index cards for each individual were recorded the initial judgments and basis therefor, and the actual sex and age as determined by gonads and skull. In this way the most stable characters could be tested by actual practice, and features that represented mere individual variation could be weeded out. Since they were examined at once and only material of the same date compared, the element of seasonal variation was likewise eliminated.

The following characters were considered:

1. *Color of feet and legs.*—Since in juvenal birds on the nesting grounds these are light horn-color, it was hoped that the lighter legs in the fall might represent first-year birds, but the extremes of color from almost black to light brown were found indiscriminately in young and old of both sexes.

2. *Color of bill.*—Likewise horn-colored in juvenals, but found darkening before the birds had attained their full size in August, and indistinguishable by October.

3. *Color of iris.*—Uniformly dark brown.

4. *Feather wear on tails.*—A dangerous character, since it varies with the season and the individual, but young birds frequently showed more ragged rectrices than adults of the same date, and this was sometimes found useful in distinguishing adult females from first-year males.

5. *Amount of white edgings to tail feathers.*—This character, while it varies seasonally as the feathers wear down, is an individual matter.

6. *Amount of rusty wash on nape.*—This feature varies considerably with the geographical distribution and the season; there is no correlation with the present problem.

7. *Shade of rufous on back and crown, and ochraceous on sides.*—Females are often reputed to be duller or paler, and occasionally are, but they are just as likely to be brighter; and these differences, even when present, are so infinitesimal that they are scarcely a safe criterion.

8. *Width of crown.*—In live birds or freshly collected specimens, when the feathers are lying normally, there seems to be a minute but definite difference, the males being slightly wider across the top of the head. This criterion was frequently used successfully in judging the sexes, but since it is at best but a relative value and an exceedingly fine point, it is safer to rely on other characters discussed below.

9. *Amount of veiling of crown.*—This difficult character, although constantly shifting as the season progressed and exhibiting every shade of intergradation, was nevertheless one of the most usable. As accurately as was possible with such relative terms, the specimens were classified under four headings on the basis of crown plumage. Examples of each class, from the sex where that plumage seemed to predominate, are sketched below (Figure 1).

Male.—Adult males fell in equal proportions between classes A and B, with two or three heavily veiled. First-year males were more apt to be sparsely veiled, but over a third were as heavily marked as any adults. Three exhibited a vague trace of the dark shafts of first-year female plumage. Usually the male markings were distributed as loose fleckings of buff over the whole crown, whereas in the female it was more heavily concentrated toward the center.

Female.—Adult females were classed most frequently in C, a few in B, the concentration of buffy edgings toward the center crown

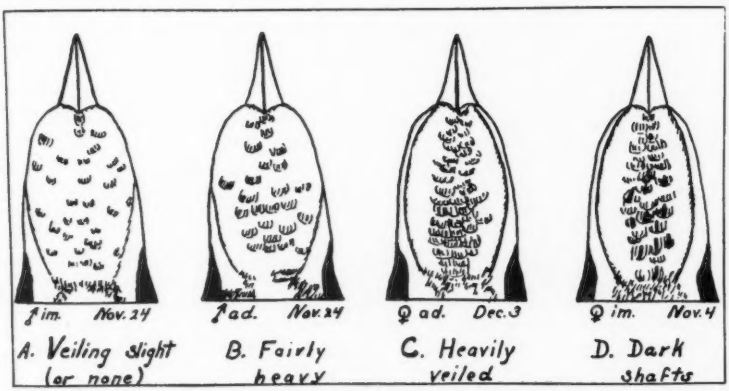
often (though not always) distinguishing them from males equally heavily veiled. Five showed more or less distinct dark shafts; two had practically no veiling whatever. Young females were frequently confused with adults of the same sex; and one exhibited no veiling whatever. The possession of distinct dark shafts in the center of lower crown feathers was, however, a characteristic feature of first-year females, being found in two-thirds of this group, and only suggested in a very small percentage of the other groups.

10. *Measurements.*—Here at last is a definite, though unfortunately not absolute, criterion for sexing this species externally. The following measurements were taken before skinning: *Total length* (from tip of bill to tip of tail), and *extent* (between tips of outstretched wings). Neither of these was found particularly valuable, varying too much with the degree of stretching given the birds. They would not, moreover, be applicable to living birds at the banding station.

Wing.—This measurement, since it differs quite markedly from Ridgway's figures, may require an explanation of the method followed in securing it. A thin celluloid rule was slipped between the bird's body and the folded wing, and the wing pressed gently against it in order to straighten any curvature of the primaries. The measurement was taken from bend of wing to tip of the longest primary. This method was found to give fairly uniform results with both live birds at the banding station and specimens in the laboratory.

Tail.—Here the celluloid rule was slipped along the tail and under the upper tail coverts until it just touched the oil gland, a point which was found especially convenient with living birds. Measurements were taken from that point to the tip of the longest tail feather.

FIGURE 1



Veiling of Tree Sparrow Crown Feathers

Weight.—While these figures were interesting in themselves, and showed differences in the average for each group, there was too much variation and overlapping to be of any value in differentiating sex or age.

In the accompanying table are given the average, normal range, and extremes of measurements of the 129 individuals used in this study.

MEASUREMENTS OF 129 SPECIMENS OF *SPIZELLA A. ARBOREA*

Measurements	*ad.*	*im.*	*ad.*	*im.*
Wing	*mm.*	*mm.*	*mm.*	*mm.*
Average	78.00	76.86	74.63	73.13
Normal range	80–77	79–75	76–72	74–71
Extremes	81, 74	79, 71	79, 72	79, 70
Tail				
Average	71.75	70.10	68.26	67.74
Normal range	73–70	72–68	70–67	70–66
Extremes	76, 68	76, 64	72, 65	70, 65
[1]*Weight*	*gms.*	*gms.*	*gms.*	*gms.*
Average	19.47	19.28	18.62	18.85
Maximum	22.70	22.60	20.70	20.00
Minimum	15.90	15.30	15.00	15.30

As can be seen, there is normally a complete overlapping within the sexes, which makes measurements useless for age study. Their value in determining sex, however, may be judged by the following figures:

Of the 129 *Wing* measurements:

3 males were unusually small,
4 females were unusually large,
30 were within border-line measurements of 76 and 75 mm. (chiefly young males and adult females).
Total 37, or 28.68 per cent possibility of error.
Only 6.20 per cent (adult males) } absolutely identifiable as to both age and
5.66 per cent (young females) } sex by wing measurements.

In *Tail* measurements only:

12.40 per cent of the males were above female figures,
17.05 per cent of the females were below male figures,
Total 70.55 per cent possibility of error.

The danger of using only one character was forcefully brought home to me in two cases at my banding station. No. A186836, when banded in 1933, was classed as a female with a wing of 72 mm. Upon its return in 1935 it exhibited a 78-mm. wing and all the external features of a healthy male. No. A186832, likewise banded in 1933, was found dead in 1935, and although a female at least two and a half years old, showed decided dark shafts.

In *summary*, then, there is no one criterion for determining the sex

[1]Based on year's figures.

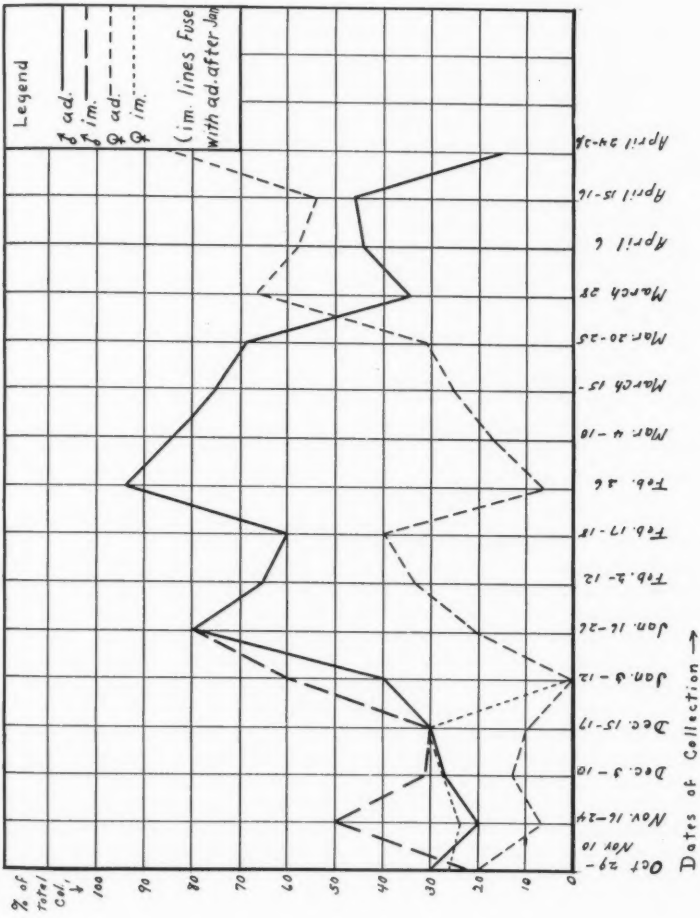


FIGURE 2 Migration of Sexes at Ithaca, N. Y.

or age of Tree Sparrows upon external evidence. In general, the unusually large birds are adult males, and the smallest ones, with distinct dark shafts on the crown feathers are first-year females. Greater feather wear of the tail may indicate a young bird. Age, however, cannot be definitely established externally. To determine sex, for most individuals a combination of factors must be considered: measurements, width of crown, and amount of veiling of crown. First-year males and adult females are most easily confused, and sometimes impossible to distinguish.

In a practical test with 129 birds judged on the basis of these external criteria, dissection disclosed the following results:

Male adult—36 birds all judged correctly.
Male immature—5 of 43 incorrect.
Female adult—7 of 19 incorrect.
Female immature—31 all correct.
Percentage of error—9.30 (all among adult female and young male groups).

Relation of Sexes and Ages in Winter and in Migration

Assuming, then, that with reasonable care, sex and sometimes age of Tree Sparrows can be determined by external characters with some degree of accuracy, to what use can such knowledge be applied? At Ithaca, New York, a number of interesting problems were begun, which might well be extended to other regions. While the Ithaca data are based on collected specimens, it is firmly believed that in the light of the above-mentioned facts, practically identical results could be obtained at the banding station.

The problem of family continuity among birds is always intriguing, and considerable seasonal variation was noted in the relations of sexes and ages of Tree Sparrows, as indicated in the accompanying graph (Figure 2). During the autumn migration young and old of both sexes were travelling together, and the guess may be hazarded that these flocks represented neighborhood groups, as is the case with other species. Throughout the unsettled fall months the sexes were more or less equally divided. With the midwinter settling, males were found conspicuously more abundant, maintaining their majority until near the end of March. Females began to increase proportionately during that month, definitely exceeding the males by the last week, the same period which at the banding station had marked the last appearance of so many residents and the greatest influx of new birds. From Clayton, Illinois, Mr. R. S. Davis writes me that the first females appeared at his banding station on March 22d, 25th, and 23d of three recent seasons. Dr. L. E. Hicks found a similar proportion among thirty-one Tree Sparrows collected in Ohio during the spring of 1935. While the first of the female migration thus coincides with the male movement, the main bulk appears during April, and the last birds of the season are almost entirely

females, accompanied by one or two small males, possibly first-year birds.

Since these figures indicated with reasonable certainty that the bulk of the females must winter farther south, I wrote to all the leading museums of the country for lists of their Tree Sparrow specimens, in the hope of plotting the respective winter territories. The dates, December 20th and March 1st, were arbitrarily set as the limits of the non-migratory winter period. While there is considerable possibility of error due to late or early migrations, to inexpert determination of sexes, or to lack of a representative number of specimens for many localities, the results are nevertheless suggestive.

In three regions these elements of chance were eliminated by personal collection or by sufficient data to assure a good cross-section, with results that are in perfect accordance with our theory:

Part of Range of Species	*Locality*	*No. of Winter*	
		Males	*Females*
North.	New York State (chiefly from Ithaca, personal collection)	102	31
Central.	Indiana (Indianapolis, col. January 3, 1935, dissected by A. M. H.)	16	22
South Central.	Kansas (U. S. Biol. Surv. and University of Kansas collections)	185	158

NORMAL INDIVIDUAL VARIATIONS

Many of these have already been discussed in the preceding section, e.g., measurements; color of legs and feet; amount of white edgings to tail feathers; veiling of crown; shade and amount of rufous on crown, nape, back, of ochraceous buff on sides. In the latter particular fall specimens from Ithaca, New York, range from extremely rich plumages where the rufous edgings of the back are the predominant color, to pale sandy individuals whose coloring is not far removed from the Western sub-species (*ochracea*). There is also some variation in the amount of rufous and buffy in the cheek region and on bend of wing. Some individuals have an almost continuous band of pale rufous or buff across the breast, distinct from the grayer throat and whiter belly. The dark breast spot varies in size and distinctness and may be almost totally concealed or double.

The two white wing-bars are a constant feature, but may or may not be in evidence, depending upon the manner in which the bird is fluffing the feathers on breast, side, or scapulars. The same individual seen several times in one day may appear different in this respect every time.

The bill occasionally shows variation in length of the upper mandible. Normally it barely overlaps the lower, but in a few cases it has been found to exceed its mate by a full millimeter.

Mr. C. L. Whittle (*Bulletin of Northeastern Bird-Banding Association*, 1928), comments on a structural peculiarity of the superciliary stripe which he designates as horns. It was observed particularly on one banded bird at least two and one half years old, but is not accidental, as he has seen one or more such birds every winter, among his oldest returns. In order to observe this phenomenon, Mr. Whittle writes me, the bird must be viewed tangentially and at very close range, when the elongation at the central superciliary feathers may appear as distinct points above the crown.

ABNORMAL COLORATION

Although the Tree Sparrow is one of the most frequent visitors at banding stations and is richly represented in museum collections, there are few cases in the literature of albinism, either complete or partial, and none of other plumage abnormalities. The following cases represent the only records I was able to obtain from ornithological literature or museum specimens.

1. *Complete albinism.*—*The Ornithologist and Oolgist* (13, 1, p. 13, 1888) cites a perfect case, shot on Cape Cod, Massachusetts, November 18, 1887, and brought to F. B. Webster. William Moody informs me that he observed one near Chicago, Illinois, October, 1934, in company with a flock of normal birds. It was positively identified by the size, shape, bill, and general behavior.

2. *Incomplete albinism.*—Four specimens have been collected in which albinism is generally distributed over the body, but color is faded rather than completely lost. These are deposited at Ohio State (specimen examined), Carnegie (Todd, 1904), Princeton (described for me by C. H. Rogers), and U. S. National (specimen examined) Museums. In these, the blackish areas—wings, tail, streakings on back, pectoral spot, upper mandible, and legs—are faded to pale brownish grey, dirty white, or cream. The other areas are correspondingly lighter, so that the chestnut of crown, postocular streak, edgings to back and wing feathers, and patch at bend of wing are faded to the same color as the buffy edgings and sides, giving the whole bird an even tawny yellowish appearance. In the last two specimens the chestnut and buffy areas are practically normal, producing an effect of unrelieved brightness. The whitish areas of under parts are somewhat lighter than normal.

3. *Localized albinism.*—Mrs. Sadie B. Knox[2], in banding A23575 on November 3, 1925, observed that two inner tail feathers were white, and that when it returned the next year, these feathers were again white, indicating a true case of albinism.

[2] *Bulletin of the Northeastern Bird-Banding Association*, Vol. III, p. 56, 1927.

BANDING STUDIES OF SEMIDOMESTICATED MALLARD DUCKS[1]

By PAUL L. ERRINGTON, Iowa State College, and
W. E. ALBERT, JR., Iowa Conservation Commission

F. C. LINCOLN has recently presented data and raised questions of extreme significance to persons interested in supplementing our precariously situated stock of wild ducks through the release of birds raised by artificial propagation.[2]

He points out that the banding operations of the United States Biological Survey had, at the time of writing, resulted in the marking of more than 125,000 native wild-caught ducks, of which an average of about 12 per cent had been recovered the first season, and of which the cumulative recovery over a period of years had been from 20 to 25 per cent. Contrasted with these recovery percentages, the recovery rate for the more than 3500 captive-bred Mallards liberated with Biological Survey bands amounted to a little less than 1½ per cent.

Lincoln (p. 313) suggests two possible explanations as to what may become of the hand-reared Mallards which are released never to be heard of again: "Possibly, because of their semidomestication, they are merely leading lives of indolence in the marshes, refusing to migrate or to fly for the hunter; or else, untrained in the rigors of natural environments, and being solely on their own resources, they may be unable to cope with living conditions and so succumb rapidly to the elements and to natural enemies."

The discontinuation in 1932 of a State Game Farm at Lansing, Iowa, made available for study a stock of several hundred Mallard Ducks of all degrees of domestication. The old game farm was situated adjacent to part of the Upper Mississippi Wild Life Refuge in bottomland environment of the same general type. The stock of ducks was left free to come or go, but most of the birds elected to remain about the game farm premises, at least for the first season after release.

An arrangement was made with the Fish and Game Commission by which Albert, whose residence was at Lansing, would be enabled to take care of whatever trapping and banding would be necessary to the investigational plans as worked out.

A special effort was made to band the wildest broods of well-grown young that could be caught, these young, of course, being the progeny of semidomesticated game farm adults. A total of 276 of

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[1]Journal Paper No. J303 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 320.

[2]"Restocking of Marshes with Hand-Reared Mallards not Proved Practicable." *Yearbook of the United States Department of Agriculture*, 1934. pp. 310–313.)

these young were banded from July 7 to September 12, 1932 (U. S. B. S. bands B668901-B669000, B671901-B672000, B672901-B672976). From July 7 to August 28, 1933, bands were placed on 74 more young, captured before they could fly (A721801-A721803, A721806-A721852, A721854-A721877).

Continued banding of adults, particularly migrants, was carried on whenever the opportunity presented itself, but further reference to this is omitted as not being within the province of this paper.

Concerted "round-ups" of all catchable ducks were made in December, 1932; on July 7, August 28, and November 20, 1933; on March 7 and September 29, 1934; on March 8, from April 23 to May 6, and on October 8, 1935. The birds were caught in a large baited pen trap, and we believe that the various catches represent nearly all of the ducks frequenting the precise vicinity at each time, up to March 7, 1934, when between 75 and 100 birds, both with and without bands, were observed to frequent the place but couldn't be caught. Thereafter, the birds became increasingly difficult to trap, and the checkups less reliable.

The resulting records may provide something of an inkling as to the habits and survival of the increase from Mallard stock originally propagated artificially, the young, however, being reared under conditions of freedom, although still somewhat attracted to their natal locality by the corn put out prior to the "round-ups." Although the corn was supplied irregularly in quantities much too insufficient to sustain them, that which was so easily available doubtless was favored over more inconveniently accessible corn to be found in fields on the mainland and over many foods occurring naturally in the waters and vegetation of the great refuge which the old game farm property adjoins.

"B" SERIES (see this page above)

Of the 276 young of the "B" series, banded during the summer of 1932, but 3 (1.1 per cent) were reported as shot by hunters. Two of these (B668988 and B671969) were killed on the opening day of the duck season, October 1, 1932, at Lansing, near the place where they were banded. The third (B671972) was shot November 1, 1933, at Lynxville, Wisconsin, about ten miles down river.

Fifty-nine (21.4 per cent) were never trapped nor heard of again after the summer of 1932. Fifty-nine also (21.4 per cent) were recorded only in December, 1932, at the most but a few months after banding.

The balance of 155 (56.1 per cent) were recaptured from time to time subsequent to December, 1932. These, in the main, stayed about the game farm premises with fair regularity or until they finally disappeared. Seven of them, because of their infrequency or irregularity of capture, were suspected of having joined wild flocks during the seasonal flights.

The sex ratio of the birds in distinctive plumage when handled was 75 males to 80 females, or probably not far from a representative proportion for the species.

For data from the "B" series birds, summarized in more detail, the reader is referred to Table I.

TABLE I

SUMMARIZED DATA FROM "B" SERIES MALLARDS

Young Birds Banded during Summer, 1932	*Number of Birds*	*Per cent*	*Sex Ratio M*	*F*
Birds regularly				
Resident to May 6, 1935	60	21.8	25	35
Resident to September 29, 1934	14[3]	5.1	9	5
Resident to March 7, 1934	42	15.2	17	25
Resident to November 20, 1933	8	2.9	7	1
Resident to summer, 1933	24	8.7	14	10
Resident to December, 1932	59	21.4	?	?
Birds apparently at large	7	2.5	3	4
Birds never retrapped nor heard of again	59	21.4	?	?
Returns from birds killed by hunters	3	1.1	?	?
Totals	276	100.1	75	80

"A" SERIES

The 74 young birds of the "A" series may be subdivided into 50 birds of normal development for the season and 24 from late broods. Both lots were banded before they were capable of flight and at about the same developmental stage, the 50 on July 7 and the 24 on August 28, 1933. The data from these lots may be presented separately (Tables II and III).

Eighteen (36 per cent) of the 50 birds in the early brood lot were never retrapped after banding. Two were found dead locally (A721807 and A721850); none were reported killed by hunters. The sex ratio of the other 32 which had records as repeaters was 13 males to 19 females.

Of the 24 brood birds, 9 (37.5 per cent) were never retrapped nor heard of after banding on August 28, 1933. None were reported killed by hunters. The sex ratio of 15 birds later retrapped was 3 males to 12 females. Four females, on the basis of their dates of capture, may have been leading independent lives and migrating with the flights.

TABLE II

SUMMARIZED DATA FROM "A" SERIES NORMAL-BROOD MALLARDS

Normal Brood Young Banded July 7, 1933	*Number of Birds*	*Per cent*	*Sex Ratio M*	*F*
Birds regularly				
Resident to May 6, 1935	16	32.0	6	10
Resident to September 29, 1934	6	12.0	2	4
Resident to March 7, 1934	2	4.0	1	1
Resident to November 20, 1933	3	6.0	1	2
Resident to August 28, 1933	5	10.0	3	2
Birds apparently at large	0	...	..	..
Birds never retrapped nor heard of again	18[4]	36.0	?	?
Returns from birds killed by hunters	0	...	..	..
Totals	50	100.0	13	19

[3]One of these, a male, was subsequently found dead.
[4]Two birds were subsequently found dead.

TABLE III

SUMMARIZED DATA FROM "A" SERIES—LATE-BROOD MALLARDS

Late-Brood Young Banded August 28, 1933	*Number of Birds*	*Per cent*	*Sex Ratio M*	*F*
Birds regularly				
Resident to May 6, 1935	4	16.7	1	3
Resident to September 29, 1934	0	..	..	..
Resident to March 7, 1934	3[4]	12.5	1	2
Resident to November 20, 1933	4	16.7	1	3
Birds apparently at large	4	16.7	0	4
Birds never retrapped nor heard of again	9	37.5	?	?
Returns from birds killed by hunters	0	..	..	..
Totals	24	100.1	3	12

[4]One female subsequently found dead.

SUMMARY AND CONCLUSIONS

From Table IV, in which the salient data from both "B" and "A" series are summarized, a few conclusions may be drawn. What may be the full significance of some of the data we can at this time only conjecture.

TABLE IV

SUMMARY OF DATA FROM BOTH "B" AND "A" SERIES MALLARDS

Young Birds Banded during summers of 1932 and 1933 Total: 350	*Number of Birds*	*Per cent*	*Sex Ratio M*	*F*
Birds regularly				
Resident until approximately the second summer after banding	94	26.9	41	53
Resident until the first summer after banding	80	22.9	40	40
Resident until the fall following banding	76	21.7	7	10
Birds apparently at large	11	3.1	3	8
Birds never retrapped after banding	86	24.6	?	?
Returns from birds killed by hunters during the first two hunting seasons after banding	3[5]	0.9	..	..
Totals	250[6]	100.1	91	111

The majority of the data are nearly equally divisible into four chief categories. A little over one fourth of the 350 birds banded while young remained regular local residents until the second summer following. A little less than one-fourth remained until the first summer before they were lost track of; a similar number were recorded no later than the fall following banding. Almost exactly one fourth were never retrapped nor heard of again.

It is practically a certainty that a strong 60 per cent or more of the originally banded young ducks were no longer on the area two years afterward. The figure may be as high as 70 per cent. The preponderance of the birds which have disappeared, we may suppose, are either dead or are living elsewhere.

Numbers of those which have disappeared from the immediate area may be living somewhere, but the very low percentage of

[5]All shot locally, or practically so.
[6]Four birds were subsequently found dead locally.

returns from birds shot by hunters (two-season total of 0.9 per cent compared to Lincoln's 12 per cent first-season expectation for wild birds) does not indicate that very many have fully reverted to the wild state. It is significant to note that despite the immaturity of these birds at banding, three quarters were known to have attained December size.

One reasonable supposition is, if the records of the missing birds have not been terminated by death, that at least some of them have migrated only to establish themselves *en route* on refuges on which they have found things to their liking. The corn and open water of city parks, game-farm wintering pens, private as well as public refuges, great and small, all on occasion have proved attractive enough to draw and hold stragglers from the outside, many of which have been distinctly tame from the time that they have come in. The observed reaction of more or less tame Mallards to steady feeding and their ultimate degeneration into "barnyard puddle ducks" surely support Lincoln's suggestion that some may be "merely leading lives of indolence in the marshes." It is doubtful that these birds would be able to live sedentary lives in North Central States marshes without winter feeding by man.

The authors, however, consider most plausible Lincoln's alternative suggestion to the effect that the missing birds may no longer exist. One would think that the tameness of the birds which would tend to lead them to man-supplied corn in refuges would also tend to lead them within shotgun range to some extent. But we have to confront us always the exceedingly low rate of banding returns. Indeed, whatever else the data may or may not show, one is not to escape the obvious conclusion that few of the semidomesticated mallards are shot.

THE WING MOLT IN PURPLE FINCHES

By M. J. MAGEE

EARLY in September I received a letter from Mrs. Margaret M. Nice, one of the Associate Editors of *Bird-Banding*. Mrs. Nice wrote that Mr. R. E. Moreau, East African Agricultural Research Station, Amani, Tanganyika Territory, Africa, was seeking information as to the length of time for the wing molt in individual birds, and she asked me to write him if I could give him any information. As for four years I have made a systematic study of the molt of the flight feathers (primaries, secondaries, and tertiaries) of the Purple Finch (*Carpodacus p. purpureus*), I was able to give him some details in the case of this particular species.

The great difficulty has been to trap the same bird near the end of its molt that you had in hand at the beginning of its molt. Most of the Purple Finches that are trapped near the beginning of their

molt move away before the molt is completed, so that the majority of these birds I get near the end of their molt have not been trapped before. However, I do get some.

Jonathan Dwight, Jr., in "The Sequence of Plumages and Moults of the Passerine Birds of New York" states that the innermost primary is usually the first to fall in passerine birds in general and that the innermost secondary falls at very nearly the same time as the outermost primary.[1]

My study of the Purple Finch shows, in most cases, that the outermost primary is fully grown some days before the innermost secondary is fully grown. Here are two examples, both birds adult males: September 14, 1931, second primary, seven-eighths grown; first primary, three-quarters grown; fourth secondary, three-quarters grown; fifth, quarter grown; sixth, fallen; October 23, 1932, first primary, three-quarters grown; fourth, secondary, nearly grown; fifth, quarter grown; and sixth, fallen.

As to the length of time for the molt of the primaries, Dwight states: "From the examination of specimens, it is impossible to determine the exact time required for a complete renewal of this most important row of flight-feathers. . . . I should estimate the time at about one month or probably a little longer. In extensive series of a few species, I find that the period between the earliest date of a specimen showing loss of the proximal primary and the earliest date of a specimen showing the distal primary fully grown varies between a month and six or eight weeks."

For the Purple Finch I estimate that the shortest time for the molt of the primaries is about seven weeks, the average lying between nine and ten weeks. My earliest date for a Purple Finch with ninth primary out is July 5th and the earliest date for a Purple Finch with first primary fully grown is September 9th.

Dwight also states that the adult Purple Finch begins to molt early in August. Many of my adult Purple Finches begin their molt earlier than this. From July 1st to 15th this year, 1935, I banded fifty-five Purple Finches, and molting had started on twenty-seven. From July 15th to the 31st, I banded forty-three Purple Finches, and of these, only three were not molting.

The wing of the Purple Finch has nine primaries, six secondaries, and three tertiaries. The outer primary is number one, the innermost, nine; the outer secondary is number one, the innermost, six. The tertiaries are molted after the beginning of the molt and are grown before the end of the molt, so it is not necessary to take them into consideration when determining the length of the molting period. The ninth primary is usually the first to fall out. In a number, the eighth and ninth fall out at the same time, but in some the

[1] *Annals New York Acad. Sci.*, XIII (1900), pp. 87–89.

eighth falls first. In some, the first primary and sixth secondary are about grown at the same time, but usually the sixth secondary is the last to be fully grown, so that if one can determine when the ninth primary falls (in some cases the eighth), and when the sixth secondary is fully grown, we can estimate the length of time required for the molt of the flight feathers.

In four years of observation on the molt of the flight feathers, I trapped over fourteen hundred molting adult Purple Finches (young-of-the-year do not molt their flight feathers until the following year).

Two difficulties that prevent an exact determination of the facts are: first, in fluttering around in the traps many birds lose some feathers that naturally would not have fallen out for a day or two; second, the eye is not quite accurate in measuring the amount of feather growth. When I estimate the growth of a feather as quarter, half, etc., of its entire length, the exact length may be a fraction more or a fraction less, which might make a difference of a day or two in estimating the length of time for a complete molt. However, in handling a large number of birds, these differences would not be serious.

During my four years of observation, the earliest and latest dates for the ninth primary to fall and the earliest and latest dates for the sixth secondary to be fully grown are as follows: ninth primary, fifth grown on July 8th. Allowing three days for the growth of the fifth, the earliest date of the ninth primary to fall was July 5th. The latest date for ninth primary to fall was August 21st. The sixth secondary was three-quarters grown on September 13th. Allowing three days for the growth of the last quarter, the earliest date for complete molt becomes September 16th. The latest date, November 2d, was for a bird trapped October 27th with sixth secondary half grown; add six days to complete molt, and we get the latest date, November 2d. If we consider the earliest dates, July 5th to September 16th, we have seventy-three days for the length of the molt. If we consider the latest dates, August 21st to November 2d, we again have seventy-three days. Seventy-three days is just one day more than my estimated average, which is ten weeks and two days.

The length of time for the ninth primary to grow is from eleven to sixteen days. I estimate the average at fourteen days. My records for the time of growth of the sixth secondary are not very many, but I estimate the time to be from ten to twelve days.

The Purple Finch making a complete molt of its flight feathers in the shortest time was a female at least four years old that year. The ninth primary fell July 31st and the sixth secondary was half grown on September 18th. Add six days to allow for growth of the sixth secondary, and the time for complete molt becomes seven weeks and six days. This female Purple Finch is of particular interest, as I have some data on the molt of her flight feathers for five successive years. The first year, on September 13th, the first primary was

two-thirds grown, the second secondary, seven-eighths grown. The second year, on October 10th, the first primary was three-quarters grown, and the sixth secondary had fallen. The third year, on July 18th, the ninth and eighth primaries had fallen; on September 26th, the sixth secondary was seven-eighths grown. The fourth year, on July 31st, the ninth and eighth primaries had fallen; on September 18th, the first primary was two-thirds grown, and the sixth secondary was half grown. The fifth year, on July 26th, the ninth and eighth primaries were just showing. For the third and fourth years, the time for the complete molt of the flight feathers can be estimated. For the third year, it was ten weeks and two days, which is just my estimate for the average length of time for the complete molt, and for the fourth year, which was my shortest record, the elapsed time was seven weeks and six days.

The Purple Finch requiring the longest time to make a complete molt of its flight feathers, was a male, molting into his first crimson plumage. The ninth primary was just showing on July 9th and the sixth secondary was three-quarters grown on October 11th. Add four days to allow for a quarter growth of the sixth secondary and time from ninth primary just showing back to time it fell out and the time for complete molt becomes fourteen weeks. Ten weeks and two days is the average length of time for the molt of the flight feathers on some twenty-five Purple Finches studied.

While at the annual meeting of the American Ornithologists' Union at Toronto in October, 1935, I was surprised to find that very little was known as to the length of time for the molt of the flight feathers of most species of birds. All persons with whom I talked, expressed surprise at the length of time of the molt of my adult Purple Finches. This subject offers an excellent field for banders to do some valuable work if they are so situated that they can handle many individual adult birds near the beginning and near the end of their molt. The only species available with me is the Purple Finch.

The following extracts are from a letter received from Mr. Moreau, December 4, 1935:

"In the literature there seems to be a complete lack of data on the subject of the duration of the individual's moult. Heinroth in his latest review of knowledge of moults does not mention the point at all. . . . It seems from your figures that there is wide individual variation, from which I infer that records from captive birds may be quite abnormal. . . . I was led to make my inquiry by the fact that on analysing the moult data from the birds collected in the evergreen forest here I found that about forty per cent of the population were in moult in each month from February to May, inclusive, with a smaller proportion in January and June, also. Treated statistically, my data indicated that the individual birds, on the average of all species, must take at least two months to get through their moult."

Sault Ste. Marie, Michigan, December 17, 1935.

NOTES ON THE PLUMAGES OF THE EASTERN RED-WING[1]

By FRED MALLERY PACKARD

WHILE banding many Eastern Red-wings (*Agelaius p. phœniceus*) at the Austin Ornithological Research Station one summer, the banders were surprised to find that they could not agree on the sex or age of some of the individuals they caught, in spite of recourse to the splendid ornithological library at the Station. It was evident that a study of museum specimens was needed, and this paper is an outcome of that investigation.[2]

The problem of plumages is of twofold importance to the bander. Firstly, he must have an accurate knowledge of the plumages of the species he traps, else his records will be incomplete and open to question. Scientists that do not band birds themselves often hesitate to utilize many of the available banding records in their own work because they cannot be confident that the ages and sexes of the birds are determined accurately. Dr. Mayr, of the American Museum of Natural History, told the writer that in his opinion much of the value of the banding records in this country is being lost through the inaccuracy of many banders in this matter.

Secondly, the bander alone is in a position to settle many questions relating to plumage changes which have been left unanswered by the museum taxonomists. A bird may be handled several times over a period of years by the bander, and the plumage changes noted in relation to its known age. The museum investigator can observe more details, and has more chance for direct comparison of specimens, but he can know only approximately the age of his birds when over a year old. The bander can settle questions of color (especially of soft parts) better than the museum worker, for he is handling live material in natural light. On the other hand, the bander depends upon the museums for his preliminary knowledge of the plumages. The two methods of approaching the subject must be coördinated.

The specimens of *Agelaius phœniceus* in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, and in the American Museum of Natural History, New York, including a total of 512 skins of *Agelaius p. phœniceus* and a number of other subspecies,

[1]Contribution No. 22 of the Austin Ornithological Research Station.

[2]This paper treats of aspects of ornithology that can be advantageously studied by banding, namely, plumages, sex determination, based on measurements, age, etc., a research field that can be greatly extended. I refer particularly to plumage description in general, based on living birds in the hand of known age rather than based on museum bird skins. Such descriptions will probably differ somewhat from many now accepted since the element of fading in some species will be largely eliminated. A still more important aspect is the opportunity to study the details of the molt, which in case of some species and even families, are among the ornithologist's perplexities.—THE EDITOR.

were studied with the permission of the curators of those institutions. The various plumages of the Eastern Red-wing are fairly distinctive, but the bander may have difficulty telling certain of them apart. As most of the published descriptions are either incomplete or too detailed for efficient banding purposes, the various plumages are discussed here at some length, the only characteristics considered being those which would be evident to a person holding a bird in his hand for a short time.

1. *Nestlings.* The sexes cannot be distinguished in study skins. Banders should investigate the soft parts.
2. *Juvenile Females.* (Late June to late August.)[1]
   Size: Wing (av.) 94 mm.; tail 68 mm.
   All feathers are of soft texture.

The under parts are *narrowly* streaked with dark brown, each feather being edged with *light yellow* or buff. The general appearance is of a dull-yellow wash from throat to flanks, streaked with blackish.

In midsummer (August) this plumage is completely molted for one practically indistinguishable from that of the adult females.

3. *Adult Females.* (All year.)
   Size: Wing (av.) 97.6 mm; tail 73 mm.
   Feathers noticeably stronger.

The under parts are *broadly* streaked with dark brown, each feather being edged with *ashy gray.*

The throat (and usually part of the breast) may be very light yellow, whitish, gray, salmon, or pink. This apparently depends upon the age of the individual.

The lesser coverts are (1) brown, each feather edged with buffy or yellowish; or (2) dark-centered feathers, edged with some shade of red; or (3) some or all of the feathers completely red. (This color varies from scarlet like that of the adult male to light pink.)

4. *Juvenile Males.* (Late June to late August.)
   Size: Wing (av.) 110.8 mm.; tail 81.8 mm.
   Feathers soft.

The underparts are *broadly* streaked with dark brown, as in the adult female, but each feather is edged with *creamy-yellow* or buff, instead of ashy. The throat and breast are more or less bright yellow or orange, the yellow wash lightening toward the flanks.

The lesser coverts show no sign of red.

The juvenal plumage is molted completely in midsummer and the first winter, or immature, plumage assumed.

5. *Winter Males.* (Acquired in September.)

Some immature males can be identified with certainty when their plumage is fresh, but the great majority of them are very like the adults in autumn. Most of the museum specimens taken in fall are

[1]Dates indicate the period during which the plumage is worn in Massachusetts, but hold good for most other localities.

presumably birds of the year, but it is difficult to distinguish them definitely from the adults.

In ideal first winter (immature) birds the upper parts are decidedly rich fox-red and sepia. The vanes of the flight feathers and interscapulars have a border of fox-red, on some feathers almost half the width of the vane. The rest of the vane is not black, but fairly light sepia. The characteristic "epaulets" first appear in this plumage, the lesser coverts being orange, streaked with black. The under parts are dark and variable, but there is considerable white edging to the feathers. All the feathers are soft.

The majority of the winter specimens have dark brown, rather than black dorsal feathers, but these are margined more narrowly with red-brown than in the definitely immature birds, and this color is of a lighter shade, or even whitish. The under parts have brown-black feathers edged with white, giving a scutellate effect. The texture of the feathers is variable, but generally quite soft.

Some individuals may be determined definitely as adult males. The flight feathers are longer, firmer, and blacker than those of the other winter males, although narrow russet margins are present on the dorsal feathers. The under parts are black, with little or no white on the feathers. Whether these birds are in their second winter or are older cannot be told from the skins.

6. *Spring Males.*

The winter plumage wears down until by spring there is relatively little russet or whitish edging on the back, and the ventral feathers show mere traces of white. The birds which were black, or nearly so, in autumn are now solid black except for the "epaulets."

The same reasons for uncertainty about the age of the autumn males may be applied to the spring birds. Those showing much brown dorsally are probably immature birds; but many of those which show but slight traces of brown edging to the remiges may be in either their first spring plumage or their second. The younger birds will exhibit more signs of wear, and be slightly shorter than the older ones, but this latter is not a character of much value to the bander.

A male may be definitely termed adult when he no longer shows traces of color on the back, remiges, or breast in spring, but appears solid green-black, except his epaulets. The intensity of this color varies from dull sepia to very glossy black, and it seems probable that these variations are correlated with age. It should be noted that the relative redness of the epaulets is not a good basis for determination of age, for it is an extremely variable character.

A careful perusal of these notes will disclose many statements and questions which banders might do well to corroborate or answer. The larger stations, which band many thousands of birds a year, have not the time to make detailed notes of plumages, but the problem is one which smaller stations could profitably investigate. The

information derived from such a study would be of far greater value than anything an inspection of study skins alone could produce.

KEY TO THE PLUMAGES OF *Agelaius p. phœniceus*

	Wing	*Upper Parts*	*Under Parts*	*Texture*	*When Worn*	
1	...	Mouse-gray down.	....	....	Hatching to July	Nestling
2	94 mm.	....	Light yellow, narrowly streaked with dark brown.	Soft	June to August	Juvenal ♀
3	97.6 mm.	Lesser coverts often red.	Ashy gray, broadly streaked with dark brown. Throat often colored.	Firm	All year	Adult ♀
4	110.8 mm.	Lesser coverts brown.	Yellow - cream, broadly streaked with dark brown. Throat yellow or orange.	Soft	June to September	Juvenal ♂
5	115.5 mm.	Vanes, sepia, edged broadly with fox-red. Lesser coverts orange.	Dark and variable, feathers always bordered with white.	Soft	Acquired in September	Immature ♂
5a	...	Narrow edging of russet or white dorsally. Lesser coverts orange or red.	Black with scutellate white edges to feathers; or, solid black.	Variable	Acquired in September	Indeterminate ♂
6	120.9 mm.	Solid color, sepia to black (in fall some russet on back.) Lesser coverts variable.	Solid color. Very soft, large feathers.	Firm Dorsally	By wear from 5a	Adult ♂

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THE FUTURE OF BIRD BANDING IN THE AMERICAS

By FREDERICK C. LINCOLN

AT the request of the Editor, the Biological Survey is glad to inform the readers of *Bird-Banding* of its hopes and plans for the continued development of bird banding. The word "hopes" is used advisedly, as all plans are contingent upon the provision of adequate annual funds for investigation under the appropriation to carry out the provisions of the Migratory Bird Treaty Act. As is well known to every station operator, the banding method—while easily the most valuable means for the study of living birds in a state of nature—is expensive, and this applies not only to the individual stations but also to the administrative agency.

The value of the work is, however, so obvious that the Survey feels confident that ultimately funds will be available, although they may not come as rapidly as is desirable. The system that has been developed is proving highly efficient, so expansion can be made an orderly and progressive procedure.

As is well known to all coöperators, it has been necessary during recent years to restrict drastically the number of new banding permits. This has meant the rejection of literally hundreds of unsolicited applications. Exceptions have been made when it appeared that the prospective station would fit in well with those already in operation or when the permit applicant had in mind some particular piece of research that seemed desirable.

The number of applications received has, however, resulted in the belief by the Bureau that it would be possible to place in operation 5,000 stations, which is the number estimated for our ultimate growth. According to present plans, these stations will be scattered throughout the entire Western Hemisphere. At the present time there are about 2,000. Naturally, these stations always will be concentrated in the United States and southern Canada, but there is every reason to believe that many important banding points can be established at various places in the Arctic regions of Canada, Alaska, Newfoundland, and Greenland. Ever since the banding work was taken over by the Survey there has been the closest cooperation between it and the National Parks of Canada Branch and the Bureau's relationship with other Governmental agencies, both at home and in foreign countries, is equally cordial.

In the establishment of banding stations in South and Central America and in the Caribbean region, some details must necessarily be worked out with the various officers of the different countries. These will center chiefly around the birds to be banded as, obviously, the only species that could be marked with bands of the present series are those that at one time or another are found in North

America. In this connection it should be remembered that there are some North American species that in winter travel south to Patagonia. Probably in every one of these countries there are Americans, there resident, who are more or less interested in bird-life. This has frequently been brought out by the receipt from such persons of information relative to the capture of a banded bird. Contact with these can be established through the consular service of the State Department. In addition, there will be many native citizens who will be interested. Here the Pan-American Union will be of assistance and informal conversations already held with Dr. L. S. Rowe, the Director-General, assure us of the active coöperation of that organization. Publicity concerning the work is already a matter of frequent note in clippings from Latin-American newspapers, and the January number of "Revista Rotaria" (the Spanish edition of "The Rotarian") carried an excellent illustrated article on the banding work, entitled "Adon de Van las Aves Emigradoros" by Wm. I. Lyon, President of the Inland Bird-Banding Association. A somewhat similar paper was prepared by the author and published two years ago in a journal in the Dominican Republic. During the North American Wildlife Conference in Washington (February 3 to 7 1936) opportunity was presented for a discussion of this subject with Señor Juan Zinser, Chief of the Wildlife Division, Department of Forests, Game, and Fish, of the Republic of Mexico, as a result of which, it is expected that within the year stations for the banding of migratory waterfowl will be established at strategic points in that country. The bands to be used will be furnished by the Survey. This is merely the start of banding work in Mexico, as under the New Migratory Bird Treaty there will be much closer coöperation between the bird students and wildlife officials of the two countries.

Station to station returns of banded birds always have been decidedly rare and recoveries south of the United States, particularly of the smaller species, have been almost curiosities. If, however, a few active stations can be located on important wintering grounds, and the number of stations in the United States and Canada materially increased, it would seem that data of the utmost value should result through the retrapping in the North of birds banded in the South.

In outlining this plan no attempt has been made to discuss the investigational work that will be possible. This field is almost unlimited and it is the opinion of the Survey that we have only scratched the surface of the many studies that can be carried on by means of the banding method.

To put this more or less Utopian plan into effect will cost money but the Survey is prepared to handle the details of administration whenever the necessary funds are made available.

Biological Survey, Washington, D. C.

GENERAL NOTES

Sex Ratios in Eastern Crow Populations During Winter and Spring.—Roost raids by sportsmen's clubs and other organizations have been responsible for the slaughter of many thousands of Crows in various parts of the country in recent years. The bodies of the birds at the scenes of these raids are usually piled up or left scattered about on the ground, where they may easily be gathered by any bird-student interested in such material. Often enough specimens may be obtained from a roost in this manner to give a fairly reliable cross-sectional picture of a local population for statistical analysis.

Specimens of *Corvus b. brachyrhynchos* collected in this manner by the writer at three winter roosting sites in the Finger Lakes Region of New York State near the northern border of the winter range of the species have furnished some interesting statistics on sex ratios. Of 348 wintering birds examined, 193 were males and 155 were females, a ratio of 124.5 males to a hundred females.

This preponderance of males is in striking contrast to the situation found by Dr. Lawrence E. Hicks at a roost near Zanesville, Ohio, one hundred fifty miles farther south than the New York locality (*Bird-Banding*, vol. 6, 1935, p. 35), where out of 75 specimens examined only 30 were males, a sex ratio of 66.6 males to 100 females. In other words there were 8 males with every 12 females in the Zanesville region and 15 males with every 12 females in the Finger Lakes region. This would seem to indicate, as Dr. Hicks has already suggested (*loc. cit.*), that the Eastern Crow displays a partial segregation of the sexes during the winter season, the females centering their winter distribution farther south than the males.

The accompanying table (1) gives the statistics for the New York State birds:

Winter Roosts		(*Winter Residents*)	
Month	*Males*	*Females*	♂♂ *per* 100 ♀♀
December	33	27	122.2
January	18	21	85.8
February	22	16	137.5
March	120	91	132.0
Totals	193	155	Average 124.5

Table 1: Sex ratios in crows taken at roosts in Ontario, Seneca, and Cayuga Counties, New York, winter of 1932–33.

Additional evidence of a partial segregation of the sexes of Crows in winter was procured through an examination of specimens in the United States National Museum, the American Museum of Natural History, the Museum of Comparative Zoölogy, and the Philadelphia Academy of Natural Sciences. While the specimen material in collections is not extensive enough to give a complete representative picture of the situation in individual localities, a comparison of the material from a few northern and southern localities (table 2) is at least suggestive.

General Locality	*Males*	*Females*	♂♂ *per* 100 ♀♀
Boston, Mass.	5	4	125.0
New York, N. Y.	9	7	128.7
Philadelphia, Pa.	11	19	57.9
Washington, D. C.	13	20	65.1
Currituck, N. C.	7	11	63.6

Table 2: Sex ratios of Crows in various localities along the Atlantic coast in winter (November—February) as demonstrated by museum specimens. Notice that the female heavy ratio of the southern localities is carried over into the range of *C. b. paulus*.

A study of the birds in the small roosts which spring up amongst the large winter roosts of the Finger Lakes region in late February produced some further data of interest. A small sample taken from two of these "spring roosts" contained 21 males and 32 females (sex ratio 68.7 males to 100 females), a preponderance of females similar to that found by Dr. Hicks in the winter roosts farther south (table 3).

SPRING ROOSTS (*Transients*)

Month	*Males*	*Females*	♂♂ *to* 100 ♀♀
March	16	22	72.7
April	5	10	50.0
Totals	21	32	68.7

FALL ROOSTS (*Transients*)

October	8	9	88.9

Table 3: Sex ratios from samples of transient Crow populations taken at spring and fall roosts in Ontario, Seneca, and Cayuga Counties, New York, fall, 1932, and spring, 1933.

Although the amount of material in this case is admittedly too small to permit the formulation of definite inferences, speculation on the significance of the ratios obtained is, perhaps, permissible. The question which arises is: if these new spring arrivals resemble in their sex ratio a more southern wintering population, can we conclude that they are representatives of such a southern population, migrating northward as a unit and remaining aloof from the populations encountered in transit? This would seem to be a logical interpretation, especially since a coincident sample of the birds remaining in the rapidly dwindling local winter roosts still shows in March the surplus of males of the wintering population (table 1, March). Of course it is possible that this preponderance of females in the spring roosts may be accounted for by a differential migration period, or by an early desertion of the common roosts by male birds in favor of their newly established nesting territories. Proper interpretation of such statistics awaits further observation and study.—J. T. EMLEN, JR., Division of Zoology, University of California, Davis, California.

The Bird-Banding Stations in 1934-1935.—The correction in the total number of birds banded during the year ending July 1, 1934, (*Bird Banding Notes*, 2:194) makes a rather important change in the figures presented in my article (*Bird-Banding* 6:26). Since the decrease in the total must be subtracted from those stations which banded less than one hundred birds during the year, that figure should have been 43,029, instead of 131,917, or 16 per cent of the total instead of 36 per cent. (The further corrections in the numbers for several individuals would reduce this to 29,376, or 10.7 per cent, but perhaps this should not be applied.) A similar tabulation for the year ending July 1, 1935, seems to show that the decrease in the total from the year before also has come from this remainder. My calculation shows just 104 fewer birds banded by 295 stations than by the 297 of the year before. This leaves only 17,945 to be accounted for by the smaller stations, or 7 per cent of the total. The standing of the various States has varied somewhat. Massachusetts, California and Pennsylvania show large gains, most of the other leading ones considerable losses. Alabama, Nebraska, Vermont, Washington, and Wyoming appear in the list; Colorado, Mississippi, Montana, and Rhode Island drop out. Among the States with the smaller numbers Indiana shows the most notable increase, with a little over twice as many stations and also total birds.—O. A. STEVENS, Fargo, North Dakota.

Notes on the Intelligence of the House Sparrow (*Passer d. domesticus*).—Supplementing the note by Mr. Venables in *Bird-Banding* of January, 1936, on the "Apparent Intelligence of the Sparrow and Starling at the Trap," I wish to record the following:

Of all the species of birds entering my traps this Sparrow most quickly learns to find its way out of our common funnel traps. I have watched some adults come to a bated trap for weeks. At first they carefully take all food from under the funnell entrance, frequently backing out and then gradually entering a little deeper until they slip in and out of the neck of the funnel. After a few days they are so well acquainted with the plan of the trap that they quickly run to the funnel exit opening from any part and will escape, even moving towards a person approaching. When young Sparrows follow adults to feed, or if a strange Sparrow comes with them, they are more easily confused and caught.

A House Sparrow in close quarters in a trap or cage will methodically examine all openings and chances of possible escape while other species of birds will continue to bunt their heads. Often when one is taken from the gathering cage it will face about and watch closely for a chance to slip past the hand. An astonishing thing, however, is to see one diving into and swimming under water in its efforts to escape. My first six-cell water trap, made in 1931, is still in use, where this phenomenon is repeated every summer. This trap, made of hardware cloth, is circular, thirty inches in diameter and eight inches high. It is divided by vertical walls into six triangular compartments with apices meeting in the center. A water-pan seventeen inches in diameter and three and a half inches deep is so attached to the bottom of the trap that each cell has an equal segment of the water-surface. When the pan is full of water, the dividing walls extend three-quarters of an inch below the surface, and, to prevent birds from becoming submerged, a circular piece of hardware cloth (about 13 or 14 inches in diameter) is laced to the lower edges, thus making a sort of under water floor.

In this particular trap the floor is rather scant, and a considerable space (one and a half inches) around the rim of the pan has no floor. It is into this deep-water space that the Sparrow will dive and swim twelve to fourteen inches under water across the pan, to come up in another compartment. When five or six compartments have each captured a Sparrow, sometimes two, or even three, will be found in one cell, and when the trap is approached by visitors, the birds usually promptly dive and swim back again. While all Sparrows do not "take to water," I have seen both young and adults do it. So far no other species of small birds has attempted it.—J. F. Brenckle, M.D., Northville, South Dakota.

Weekly Visits With the Black Tern in Wisconsin.—My usual procedure of Black Tern (*Chlidonias nigra surinamensis*) banding is to row a boat from one nest to the next and hunt the young that are hiding in the rushes near by. We know as we approach a nest, that a single alarm signal from the parent birds will induce the little ones to leave the nest and hide, and that they are usually very well hidden before one arrives at the nest. A continuous danger signal is given by the adult birds flying overhead while one remains in the vicinity, which increases and becomes a more rapid *kip-kip-kip* call, occasionally intermingled with a screech. The interpretation of the different calls employed by these birds, varying from very soft to loud, harsh or screechy, depending upon whether there are eggs, young, or immature flying birds, can only be acquired by careful study and observance of many individual families. The calls given by the adults are important in locating the young more readily. A call seldom heard is that of the mother bird, a soft, low cooing, calling her little ones out of hiding back to the nest, and assuring them of their safety.

In 1933 and 1934 a number of nests were marked with metal tags and a record of each was carefully kept. Many nests in the immediate vicinity were also carefully observed, and by following a marked route we avoided much useless rowing and saved the birds much disturbance. An experiment was carried out by the use of artificial eggs to determine the tenacity of the brooding parent in remaining to brood these eggs after her own were hatched. Artificial eggs were placed in fifteen nests. These eggs were turned out of hard maple wood and painted to represent a natural tern egg, for which service I am indebted to Mr. Clarence S. Jung, of Milwaukee, who kindly gave his time and the use of his machinery in their making. In some of the nests one artificial egg was placed, in others two, and the resulting behavior of the adults over a period of three weeks proved to be very interesting. It conclusively proved that you cannot fool a Black Tern into attempting to hatch wooden eggs. In the majority of nests the artificial eggs were pushed out, and usually lay about six inches away. Once a week the wooden eggs were replaced, but to no avail as each new visit found them out of the nest. Nest No. 11, which had two artificial eggs besides three of its own, was built higher than the average nest and large enough to accommodate the five eggs. This nest was basket-like, resembling that of a Gallinule or Coot, but, of course, much smaller. One of the

nests contained two eggs and one artificial egg. We found the artificial egg pushed deep into the bottom of the nest and a new floor of dead rushes laid over it. This egg was again placed in with the others, but it was out of the nest a week later.

In one of the nests, in which a pipped egg lay, a pure white artificial egg was placed. After a few minutes a hovering bird came down, stood beside the white egg viewing it with one eye and then the other, and finally attempted to pick it up with her bill as if to carry it away in the manner of carrying eggshells. The egg would always slip or roll away, whereupon she began to peck at it as if to break it. Finally she gave up, sat down on the nest, and drew the white egg under her.

Many nests are very poor at the time of the laying of the first egg. When the second and third is laid, the nests are much improved, showing at least some effort in nest-building, for the best Black Tern nest, which is only a handful of decaying vegetable matter, is nothing to marvel at. They are usually kept in good condition until the young are about nine days old, when no more material is brought to the nest, and it appears to be deserted, as the young are probably brooded elsewhere. When not in use the nests soon deteriorate, and a few rains will soon wash them away so that they become unrecognizable.—PAUL WILLIAM HOFFMANN, Milwaukee, Wisconsin.

Eastern Warbling Vireo Returns and Repeats.—At my banding station in South Dakota I have banded forty-one Eastern Warbling Vireos (*Vireo g. gilvus*), all taken in a water trap. The following table gives the bandings by months for four years:

	May	*June*	*Aug.*	*Sept.*
1932	6	2	1	0
1933	2	4	2	0
1934	18	3	0	1
1935	1	1	0	0

The earliest date of banding was May 13, 1932; the latest date was September 15, 1934. Of these bandings there were four returns and eight repeats. The returns were F97319, banded June 11, 1932, recaptured in the same place August 4, 1933; F97305, banded May 30, 1932, recaptured in the same trap June 6, 1934, after a two-year interval. This bird also repeated June 12, 1934; L3694, banded May 17, 1933 recaptured in the same place May 20, 1934; H93914, banded August 20, 1933, recaptured May 21, 1934. The repeats came back in from one- to twelve-day intervals. One bird repeated twice at two-day intervals. It is interesting to note that three of the four returns came with the largest number of bandings in May and June of 1934.—J. F. BRENCKLE, M.D., Northville, South Dakota.

Two Interesting Red-Eyed Towhee Returns-W.—In my article "Survival as Indicated by Returns to Summerville, South Carolina" in the October, 1935, number of *Bird-Banding*, pages 125 to 130, it was indicated that returns of Red-eyed Towhees did not point to a very long life-span. Therefore it is of interest to record the taking, during my sojourn in Summerville this winter, of two birds, each presumably at least six and one-half years old. These are A203980, ♂, banded January 4, 1930, and retaken on January 12, 1936, and A234731, ♀, banded February 2, 1930, and retaken this season on December 24, 1935. The latter bird had also been recorded in January, 1931; January, 1934; and January, 1935. The bands on both birds had worn so thin that it was thought best to change them, and they accordingly now carry the numbers 34-246189 and 34-246161, respectively.—WILLIAM P. WHARTON, Summerville, South Carolina.

Notes on the Wandering of Immature Catbirds.—For several years the writer has wanted to learn if the scores of immature Catbirds (*Dumetella carolinensis*) banded each season were the young of near-by-nesting summer residents. An opinion based on the inconsistency of single-seasonal matings in which the first nesting was successful has been in the negative.

During the nesting season of 1935 it was decided to secure data bearing on this matter. A diligent search was made for nests of this species in an area extending five hundred feet in all directions from my banding station in Huntington, Long Island, New York, and ten nests were found. In eight of these nests, the young were successfully reared. These fledglings, twenty-seven in all, were banded a few days before they left their nests, and the traps were carefully watched for their appearance. During the post-nesting period, eighty immature Catbirds were taken in the two dozen automatic traps we have at our banding station. Only two of the twenty-seven banded fledglings appeared in the traps. One repeated thirty-one days after leaving the nest, and the other repeated thirty-three days afterward. Each bird only appeared once.

As a means of comparison two nests of Eastern Robins (*Turdus m. migratorius*) and two nests of Wood Thrushes (*Hylocichla mustelina*), containing in all eleven fledglings, were banded, but none appeared in our traps, although other individuals of these species were taken.

Eighteen young Eastern House Wrens (*Troglodytes a. ëdon*) from four nests on the station grounds gave only two trap repeats. One bird repeated ten days after leaving its nest, and another within eighteen days. Twelve other House Wrens were taken in late July and August.

In the case of a family of Eastern Chipping Sparrows (*Spizella p. passerina*) consisting[1] of three young birds hatched just five hundred feet west of the station, one appeared on June 19th, ten days after leaving the nest. All three young stayed around the banding station for three weeks. One repeated for the last time that season on September 13.

Blue Jays (*Cyanocitta c. cristata*), like the Chipping Sparrows, also appear to confine their immature wanderings to the neighborhood of their nesting area. A family of five young banded in this area, which left the nest on June 11, all appeared in our traps. On July 10th the first one was trapped, and on July 15th three more were caught, the fifth member of this family being taken on the following day. It is probable that they were all together during this time as a family group. One bird never repeated again. One was taken once more in July. Two repeated twice in July, and two repeated through July and August. One of these Blue Jays was again trapped on September 14th.

It would appear from our records that immature Catbirds soon wander away from the neighborhood of their birthplace. It has been noted in many instances that after a successful nesting the male of the pair stays on the territory and mates again with a different female, as proved by colored banding of over one hundred resident adults. It is thought that the female wanders away with her brood at this time, possibly to nest again during the same season at some distance, when her brood has found out how to take care of themselves.—GEOFFREY GILL, 24 Overlook Drive, Huntington, L. I., N. Y.

Bat-Banding—A Request for Coöperation.—The example set by bird-banding has led mammalogists to try various methods of marking bats to study their movements and migrations. Over seven thousand bats have been banded to date by various workers in the United States and in Germany and many interesting returns have been recorded.* However, the lack of popular interest in bats has made it very difficult to secure returns.

Field ornithologists could render extremely valuable coöperation if they would watch for banded bats whenever they have an opportunity. Most of the bats

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[1]It is often assumed that the little groups of any species of young birds one observes at the close of the nesting season are of the family order. These observations of Mr. Gill, however, appear to afford the first *proof* that a brood of Chipping Sparrows and a brood of Blue Jays maintained their integrity at least for several weeks.—THE EDITOR.

*Eisentraut, M.—*Zeitschrift für Morphologie und Ökologie der Tiere*, 28 Band, 5 Heft; and *Ornithologische Monatsberichte*, 43, 1 and 43, 5; Mohr, C. E.—*Proceedings of the Pennsylvania Academy of Sciences*, Vol. 8, pp. 26–30; Griffin, D. R.—*Journal of Mammalogy*, Vol. 15, No. 3.

carry regular aluminum bird-bands around their hind legs. When[illegible]at is captured or found dead, it is well worth while to examine it to see if [illegible]ded. Full data on any recoveries of banded bats should be sent to the United States Biological Survey, Washington, D. C., or to the writer. Most of the American bat-banding work has been done in the Northeastern States, particularly Pennsylvania, Massachusetts, and Vermont. Consequently this request for coöperation is directed especially to ornithologists in this district.

It seems very desirable to locate all the large bat colonies in the New England region, in order that the bat-banding studies may be as complete as possible. If any of the readers of *Bird-Banding* know of caves where bats might hibernate in winter, or large summer colonies in buildings, they are urged to communicate with the writer.—Donald R. Griffin, Barnstable, Massachusetts.

RECENT LITERATURE

(Reviews by Margaret Morse Nice)

The articles have been selected and arranged under subjects of importance to students of the living bird, and also for the purpose of suggesting problems or aspects of problems to those banders who wish to make the most of their unique opportunities.

Headings in quotation marks are the exact titles of articles or literal translations of such titles. Except in the case of books, which always are reviewed under their titles, other headings refer to general subjects or are abbreviated from titles in foreign languages. References to periodicals are given in italics.

It is a pleasure to announce that *Bird-Banding* has added a new associate editor to the staff, Mr. Thomas T. McCabe, 2593 Life Science Building, Berkeley, California, who, beginning with this number, will review some of the books and articles.

BIRD-BANDING

Twenty-five Years of Banding in Hungary.[1]—Dr. Schenk was the third ornithologist to start banding on a regular scale, beginning in 1908, nine years after Mortensen in Denmark and five after Thienemann in Germany. He now sums up the results: 84,625 birds of 200 species ringed with 2507 recoveries—2.9 per cent. The birds ringed in greatest numbers have been Swallows, White Storks, Titmice, Herons, Glossy Ibis, Rose-colored Starling, and Red-backed Shrike. Alarmingly high percentages of recoveries are found with the Herons—from 5 to 8 per cent, and especially with the Egrets, 8.3 to 25.9 per cent, as 27 of 104 *Egretta alba* were killed. The percentages were also high with some of the Hawks, though not as bad as those given by Lincoln for this country in the January (1936) *Bird-Banding*, averaging 8 per cent for 19 species.

Banding has shown that about 80 per cent of the summer residents migrate southwest in winter, the others southeast, while a few species go in both directions. Although return to the vicinity of the birthplace was found in the majority of cases, yet a few birds have been found in the nesting season great distances from home: a Squacco Heron (*Ardella ralloides*) 300 kilometers, a Night Heron (*Nycticorax nycticorax*) 800 kilometers, a six-year-old Spoonbill (*Platalea leucorodea*) taken in Bulgaria, a five-year-old Red-footed Falcon (*Falco vespertina*) killed in Russia, and three Lapwings (*Vanellus vanellus*) as follows: one in Russia (1600 kilometers from home), one seven-year-old, 1000 kilometers from its birthplace, and a three-year-old bird taken in August in Siberia.

As to the time of reaching sexual maturity, many species besides small birds were found breeding at the age of one year: Starlings, Lapwings, Godwits, Black-headed Gulls, Black Terns, and Kentish Plover (*Charadrius a. alexandrinus*).

Interesting tables are given of the ages of the birds recovered. Birds ringed as nestlings that reached the age of ten or more years were: Black-headed Gull (*Larus*

ridib[redacted]10 years; Glossy Ibis (*Plegadis falcinellus*), 10 years; White Stork (*Ciconia ciconia*), four of 10 years, one of 19 years; Purple Heron (*Ardea purpurea*), 13 and 16 years; and Kestrel (*Falco tinnunculus*), 10 years. Birds ringed as adults reached at least the following ages: Redshank (*Tringa totanus*), 15 years; Black-tailed Godwit (*Limosa limosa*), 12 and 17 years; and Black Tern (*Chlidonias n. niger*), 18 years.

"Bird-Banding."[2]—A fine résumé of the subject by the Vogelwarte of Rossitten. There are banding stations in North America, India, Turkey, and Japan, and 34 in 22 countries of Europe, only Austria, Albania, Rumania, and Greece being unrepresented. Recoveries average 3 to 4 per cent. The chief fields of research are: migration; return of birds to their homes; experiments on homing and the migratory impulse; age attained by birds; their ecology and behavior; their economic relations.

Report on the Activities of the Vogelwarte Rossitten.[3]—A brief account of the educational and research activities of one of the two banding stations in Germany. Since 1903, 413,500 birds have been banded; many lectures and courses are given, and studies of migration and homing carried on, while at present an extensive and intensive study of the White Stork is being made.

"Fourteenth Report of the Vogelwarte of the Government Biological Station at Helgoland."[4]—The many activities of the station, both educational and scientific, are described, special emphasis being placed on various phases of the problem of migration. On Helgoland itself 62,802 birds of 152 species had been banded up to the end of 1934, the grand total since 1910, with the addition of those banded by coöperators, reaching 579,722. Recoveries have come to 13,882 (2.4 per cent). The names of individuals banding more than one thousand birds and also more than four hundred in 1933 and 1934 are listed, and references given to the reports published on the results of banding 49 different species.

Banding in Sweden.[5]—The report for 1934 of the banding of the Göteborg Natural History Museum shows 7,953 birds banded for that year, bringing the total since 1911 to 62,271 individuals of 163 species, the percentage of recoveries being 3.7. The birds ringed in greatest numbers are the Black-headed Gull (*Larus ridibundus*), Common Gull (*Larus canus*), Common, Arctic, and Sandwich Terns (*Sterna hirundo, macrura* (*paradisæo*), and *sandvicensis*), Starling (*Sturnus v. vulgaris*), and Lapwing (*Vanellus vanellus*). Longevity records include a Wood Pigeon (*Columba palumbus*) of 6 years, Common Gulls of 5 and 7 years, and Black-headed Gulls of 6, 7, 8, and 10½ years. A Common Curlew (*Numenius arquatus*) banded in Öland, June 26, 1927, was found in Lincolnshire, England, June 1, 1935.

"Where do the Migrating Birds Go?"[6]—W. I. Lyon, President of the Inland Bird Banding Association, has written an excellent popular account of bird-banding to interest our Latin-American neighbors. After emphasizing the great economic value of birds, he describes the objects of bird-banding and asks for reports on any banded birds that may come to the notice of his Rotarian readers, mentioning those species that have been banded in North America in considerable numbers and that migrate to South America.

"Trapping Cedar Waxwings in the San Joaquin Valley, California."—C. H. Feltes. 1936. *Condor*, 38:18–23. By means of specially designed traps placed on the roof of a raisin-packing plant, 4010 *Bombycilla cedrorum* were caught in 29 days; recoveries came to 5.17 per cent.

[1]Schenk, J. 1934. Die Vogelberingungen des Kgl. Ungarischen Ornithologischen Institutes in den Jahren 1931–1932. *Aquila*, 38–41:46–114.

[2]Schüz, E. 1935. Vogelberingung. *Der Biologe*, 4(7):218–223.

[3]Schüz, E. 1935. Vogelwarte Rossitten der Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften. *Der Biologe*, 4(7):225–227.

[4]Drost, R. 1936. XIV. Bericht der Vogelwarte der Staatlichen Biologischen Anstalt Helgoland. *Vogelzug*, 7:34–51.

[5]Jägerskiold, L. A. 1935. Göteborgs Naturhistoriska Museums ring-märkningar av flyttfaglar under 1934. *Göteborgs Musei Årsskrift* 1935:59–76.

[6]Lyon, Wm. I. 1936. A donde Van las Aves Emigradoras? *Revista Rotaria*, 6(1):20–22.

MIGRATION

"Research on Migration."[7]—A good summing-up of the subject. Average distance flown per day is given in a few cases: a Redstart (*Phœnicurus phœnicurus*) 167 kilometers, a Blackcap (*Sylvia atricapilla*) 220 kilometers, and a White Stork 305 kilometers, but the greatest single record is that for a Turnstone (*Arenaria i. interpres*) that flew from Helgoland to northern France in twenty-four hours, a distance of 800 kilometers.

"The Migration of North American Birds."—F. C. Lincoln. 1935. U. S. Dept. Agriculture. Circ. No. 363. 72 p. 10 cents. A survey of the subject largely as it pertains to North American birds, following to some extent the lines of Wells W. Cooke's "Bird Migration" (Dept. Bull. 185, 47 pp.) published in 1915, but with much new data added, particularly from results from banding. Much valuable material is presented, but the treatment of the relation of migration to the weather is disappointing. The "common flying speed of ducks and geese is between 40 and 50 miles an hour." "Herons, hawks, horned larks, ravens, and shrikes, timed with the speedometer of an automobile, have been found to fly 22 to 28 miles an hour, while some of the flycatchers are such slow flyers that they attain only 10 to 17 miles an hour."

"The Early Summer Migration of the Starling on the Windenburger Ecke."[8]—Starlings begin to appear in large numbers on the Kurische Nehrung not far from Rossitten about the middle of June, at first adults only, but soon largely young birds. On clear days the flight begins a half-hour before sunrise, but in rainy weather may be delayed as much as three hours. On July 1st about a third of the birds are molting, while during the last three weeks of the month this is true of the majority. The weights of the young birds averaged 63 grams early in July, but gradually increased. On Helgoland the early migration of Starlings ends the last of July, while the late migration does not begin until September.

Migration of the Common Buzzard in Germany.[9]—A study of 669 recoveries of *Buteo b. buteo* shows that the birds of different regions have different migration routes and quarters. Young birds are more migratory than the old, but all return to the region of the birthplace to breed, the species apparently reaching sexual maturity at the age of one year. Recoveries reached 22 per cent. Buzzards, living as they do largely on mice, show high mortality in severe winters with much snow. The oldest bird recorded reached an age of fifteen and a half years.

[7]Drost, R. 1935. Vogelzugforschung. *Der Biologe*, 4(7):210–218.

[8]Krätzig, H. 1936. Der Frühsommerzug des Stars auf der Windenburger Ecke. *Vogelzug*, 7:1–16.

[9]Burr, F. 1936. Ueber die jahreszeitliche Verbreitung des Mäusebussards (*Buteo b. buteo* L.). *Vogelzug*, 7:17–34.

HOMING

"Have Birds a Locality Sense?"[10]—In this important paper Dr. Stresemann states that he used to believe with the majority of ornithologists that homing depended on visual memory rather than on a locality sense, but the researches of his pupil W. Rüppell caused him to change his opinion. The first experiments with nesting Starlings were reviewed in *Bird-Banding* for October, 1935; later ones involved longer distances, up to 730 kilometers, while nesting Swallows (*Hirundo r. rustica*) and Martins (*Delichon urbica*) were taken from Bremen to England, 700 kilometers distant. (To eliminate the possibility of kinæsthetic impressions, some of the Starlings were rotated on Victrola disks during the journey.) Yet 50 to 60 per cent of the birds returned, homing as well or better from the greatest distance than from the shorter ones. The author concludes with Viguier (1882) that birds must be sensitive to terrestrial magnetism, and suggests that the sense of locality may be in the labyrinth of the ear.

Experiments with the Homing of Starlings.[11]—In order to test whether kinæsthetic impressions influence homing of *Sturnus v. vulgaris*, Dr. Kluivjer sent thirty-three nesting Starlings from Wageninen to Groningen, 150 kilometers to the northeast and entirely outside the known range of the birds breeding at Wageningen; ten of these had been narcotized with Evipan-Natrium during the whole journey, the others being also dosed, but allowed to recover before the trip. Sixty per cent of the first group returned and only 22 per cent of the others. Although the experiment shows conclusively that kinæsthetic impressions can have nothing to do with homing, nevertheless I regret that the splendid population study with these Starlings was upset, some of the most interesting birds failing to return.

[10]Stresemann, E. 1935. Haben die Vögel einen Ortsinn? *Ardea*, 24, 213–226.

[11]Kluijver, H. N. 1935. Ergebnisse eines Versuches über das Heimfindvermögen von Staren. *Ardea*, 24:227–239.

LONGEVITY

Oyster-catcher Twenty-two Years Old.[12]—A *Hæmatopus ostralegus* banded as a young bird on the Hallig Nooderoog July 9, 1914, was found dead in 1934 on the Minsener Oldoog, east of Wangerooge.

A Swift (*Apus a. apus*)[13] was captured in England where it had been ringed as full-grown 13 years before.

"The Cardinal Now Twelve Years Old."—A. F. Ganier. 1935. *Wilson Bulletin*, 47:285–286. Although this male *Richmondena c. cardinalis* is at least twelve and a half years old, the only sign of age is a rather bedraggled appearance at molting time.

"A Herring Gull of Great Age."—T. G. Pearson. 1935. *Bird-Lore*, 37:412–413. A male *Larus argentatus* in adult plumage was wing-tipped in 1889 and kept as a pet until its death apparently of old age in July, 1935, at an age of at least 49 years. He is "survived by his mate, which is at least 45 years old, and by three descendants, all more than 30 years."

Other records on longevity will be found in Numbers 1, 5, 9 and 17. The attention of readers is called to the Osprey (*Pandion haliaëtus*) 21 years old reported by F. C. Lincoln in the January (1936) *Bird-Banding*, p. 42, this being the greatest known age reached by any bird banded in North America, and so far as I know, the highest record for one of the Falconiformes not in captivity.

[12]Weigold, H. 1936. Austernfischer (*Hæmatopus ostralegus*) 22 Jahre alt. *Vogelzug*, 7:52.

[13]Recovery of Marked Birds. 1936. *British Birds*, 29:277–283.

LIFE HISTORY

Polygamy in a Starling.[14]—Very interesting observations in Wetzler in Eastern Germany made possible through the use of colored bands. On April 12th the male Gelbring built with his first mate in box 2, both sleeping together in box 4, while the female Linksring built without a mate in box 1. On April 21st he carried material into 3 boxes and was mated with Linksring. He shared incubation with both wives, nevertheless, at box 4 he behaved like a bachelor, carrying in grass and green things, and singing and courting passing Starlings! On May 4th Linksring was captured and given a colored band, but she deserted her eggs and newly hatched young. May 10th she was back again, this time in box 4 and again Gelbring's mate. The young in box 2 flew on May 26th, and on June 2d the first mate started in with her second brood, which she raised along, the young leaving July 9th. Two other pairs had two broods each, both birds of the pair feeding the first broods, but one second brood was raised by the female alone, the other by the male alone.

Inbreeding Swallows.[15]—A male Swallow (*Hirundo r. rustica*) in Germany returned to his nest of the previous year and mated with his daughter. Cases of inbreeding in the wild are exceedingly uncommon. According to Schenk[1] there

had been no proved cases of inbreeding in the records of European banders, and only two undoubted cases in America (both of brother and sister)—Shelley's Downy Woodpeckers (*Dryobates pubescens*) in New Hampshire (*Bird-Banding*, 3:69–70) and my Song Sparrows (*Melospiza melodia*) (*Condor*, 35:219–224.)

Thrush Nightingale Nesting without a Mate.[16]—The Naturwarte at Mönne in Pomerania reports an alarming decrease among the nesting birds during the last three years, and finds a disinclination to breed in many different species. A female *Luscinia luscinia* nested without a mate, deserting her set of infertile eggs after several weeks of incubating.

"**Observations on the Amethyst Sunbird,** *Chalcomitra amethystima amethystima* (**Shaw**)."—R. B. Cowles. 1936. *The Auk*, 53:28–30. Nest-building with this Sunbird in Natal, South Africa, was a prolonged process, the female working from about 10 A.M. to 3 P.M. each day from September 7th to 19th, after which a few finishing touches were added, and the first egg laid September 29th.

"Nesting of the Sierra Nevada Rosy Finch."—J. B. Dixon. 1936. *Condor*, 38:3–8. At a colony of *Leucosticte tephrocotis dawsoni* in California the females incubated, staying on the nest for 45 to 50 minutes and leaving for 15 minutes at which time the pair fed close together. Each pair had a "regular feeding ground" and any trespassing resulted in a battle. The female "rules with an iron hand during the period of nest building, egg-laying, and incubation," but the male does more than half the feeding of the young.

"The Family Relations of the Plain Titmouse."[17]—A fine study based on extensive banding of a nesting population in southern California. *Bæolophus inornatus* is permanently resident; it "usually raises only one brood a season, and is usually seen in pairs." The sexes are similar, but only the female develops a brood patch, and she alone incubates. The oldest bird is at least 7 years old, three are at least 5 and eight at least 4. There have been 33 cases of renesting in the same box, 17 at a distance of 43–90 yards, one 200 yards away, but none farther. Of 145 young banded, only two have been retaken (1.3 per cent) one 700 yards from its birthplace, the other one and a half miles. As to the "returns" of adults, this figure is 45.3 per cent if each bird is counted only once, but 52.5 per cent if each is counted each year. Eleven pairs were mated for two years, and two pairs for three years, there having been only one possible "divorce." "If a bird lost its mate the survivor, whether male or female, remained in the nesting territory and secured a new mate."

Biology of the British Stonechat.[18]—*Saxicola torquata hibernans* in Brittany is permanently resident, remaining in pairs throughout the year. Territories are taken up in October, at which time the male sings, later becoming silent until March. As to replacements, a male was killed in November, but his mate stayed in the territory and in February secured a new mate. A male killed March 11th was replaced the 24th; this bird was captured the next day and replaced six days later. Another male, killed January 10th, was replaced March 20th. The birds nest early, the female building the nest on the ground, accompanied by her mate, but in one case a male assisted in the building, the first egg being laid four days after the nest was started. Three nests in the same region weighed as follows: 15.3 grams, 41 grams, 67 grams. Five to six eggs are laid and a second brood is raised.

"The Enigma of the Cuckoo."[19]—The author, who does not believe in the existence of instincts, insists that the nestling Cuckoo does not "voluntarily" eject its fellow occupants; it is simply a matter of the smallness of the nest and largeness of the Cuckoo. "C'est une équation algébrique de la plus élémentaire solution." We can test this with our Cowbird, whose eggs are practically the same size as those of *Cuculus canorus*; the young *Molothrus ater* does not throw out its host's eggs or young, but in the majority of cases some of the host's young are raised along with the parasite.

Nesting of the Rose-colored Starling in Hungary.[20]—*Pastor roseus* winters in India, but in "grasshopper years" appears in flocks in Russia and Hungary and breeds in great companies in walls and rocky places. In one place they nested under the roofs of houses, appropriating the nests of *Passer domesticus* after they had thrown out the young! About a thousand pairs settled near the brick-works in Karcag, Hungary, in 1933; and owing to an over-supply of males, polyandry resulted. Sets contained 5 to 8 eggs, but as many were addled, not more than 4.2 young were raised per nest. The birds arrived June 5th, young began to hatch June 23d, and all the birds left from July 14th to 28th. Although great numbers have been banded, none of these have been noted in later years in Hungary, but a few young have been recovered in Italy, Greece, and Asia Minor. The behavior of another Starling that lives on grasshoppers is mentioned in No. 29.

The Feeding of Young by a Pair of Great Tits.[21]—A record was kept for sixteen hours of the number of trips made by a pair of *Parus major* in Budapest from the time the ten young were six to twenty-one days old. A third of the tail of the female was cut off as an aid to rapid identification. At first the male fed more than his mate, but at the end the count was equal—248 trips for each bird, an average of 31 trips per hour for both, the different hours varying from 7 to 49. Each bird carried off excrement 60 times. The author says that the normal time of fledging is fourteen days, but Longstaff and Jourdain[22] give eighteen to twenty-one days. L. Schuster watched a pair of this species feed about nine hundred times in the course of a day of fifteen hours—an average of sixty times an hour! (*Journal für Ornithologie*, 1923, p. 327.)

Nesting Data on the European Nuthatch.[23]—The fledging period of *Sitta europæa* is very long—four weeks according to Heinroth; Salmen thinks the incubation period must also be long—perhaps twenty days. I can find no data on either matter for our American Nuthatches.

The Terragraph at the Nest of Hoopoe and Barn Owl.—J. Bussmann has continued his valuable studies of nesting behavior by the help of the instrument which he described in the April, 1933, *Bird-Banding*. *Upupa e. epops*[24], a rare bird in Luzern Canton, Switzerland, was found nesting in a disused hut; the terragraph showed that the two young when about fourteen days old, were fed 18 times in 9 hours. A nest of *Tyto alba guttata*[25] with four young some ten days old was studied for over a month, from 4 to 32 feedings being registered a night, with an average of 13. No relation could be found between the number of feedings and the phase of the moon or the state of the weather.

"The Sex Ratio in Ducks."—O. C. Furniss. 1935. *Wilson Bulletin*, 48:277–278. Observations on fourteen species of nesting ducks were carried on daily from April 29th to May 18th, 1935, over five square miles containing eighty-three sloughs near Prince Albert, Saskatchewan. The average totals resulted in 192 males and 122 females, a sex ration of 1.6:1.

[14]Freitag, F. 1936. Aus dem Leben beringter Stare zur Fortpflanzungszeit. *Vogelring*, 8(1):8–15.
[15]Clobes, D. 1936. Rauchschwalbenberingung. *Vogelring*, 8(1):23–24.
[16]Robien, P. 1935. Brutstudien an pommerschen Vögeln. *Ornithologische Monatsberichte*, 43:183–186.
[17]Price, J. B. 1936. *Condor*, 38:23–28.
[18]Lebeurier, E. et J. Rapine. 1936. Ornithologie de la Basse-Bretagne. (Suite.) Saxicola torquata hibernans (Hartert) 1910. Le Traquet patre britannique. *L'Oiseau et la Rev. française d'Ornithologie*, 6(1):86–103.
[19]Cathelin, F. 1936. L'Enigme du Coucou. *L'Oiseau et la Rev. française. d'Ornithologie*, 6(1), 71–76.
[20]Schenk, J. 1934. Die Brutinvasion des Rosenstares in Ungarn in den Jahren 1932 und 1933. *Aquila*, 38–41:136–153.
[21]Warga, K. 1934. Positive Beobachtungen über die Fütterung der Jungen bei einem Kohlmeisenpaar. *Aquila*, 38–41:261–268.
[22]1926. *British Birds*, 20:173–176.
[23]Salmen, H. 1934. Beiträge zur Fortpflanzungsbiologie des Kleibers. (*Sitta europæa cæsia* Wolf.). *Aquila*, 38–41:270–273.
[24]1934. Der Wiedehopf im Brutreservat Baldegg-Nord. Studie am Nest. *Der Ornithologische Beobachter*, 32:17–24.
[25]1935. Der Terragraph am Schleiereulenhorst. *Der Ornithologische Beobachter*, 32:175–179.

SONG

"A Chart of Bird Song."—H. G. Alexander. 1935. *British Birds*, 29:190–198. A valuable chart showing the seasons of regular, irregular, and occasional song for birds in Southern and Midland England. Similar charts should be worked out for the different regions of our country.

"The Daily Rhythm of Birds in the Arctic Summer."[26]—Although many observers have noted the astonishing punctuality in relation to sunrise of the early morning singing of most birds, no one hitherto has worked on the problem of the daily rhythm of birds in far northern latitudes, where the light is greater all night than the "awakening light" of the latest species farther south. Dr. Palmgren found the birds in Lapland most inactive from 6 to 11 P.M., this period of rest following the hottest and dryest part of the twenty-four hours. An important paper with a good bibliography.

Is Bird Song Deteriorating in the Cities?—Decidedly so, say two German ornithologists. E. Christoleit[27] gives a gloomy list of the evil effects of civilization on birds: decreasing size (Gulls), albinism, weakening of the breeding instinct, smallness of sets, non-functioning of the migratory urge, etc., etc. The species whose songs have degenerated are Blackcap (*Sylvia atricapilla*), Thrush Nightingale (*Luscinia luscinia*), Song Thrush (*Turdus philomelus*), and Chaffinch (*Fringilla cælebs*). H. Frieling[28] attributes the deterioration in song to the lessened need for territory defence, due to increased food in gardens and parks, a point of view assuming the paramount importance of the food value of territory. What is the experience of other students?

[26]Palmgren, P. 1935. Über den Tagesrhythmus der Vögel im arktischen Sommer. *Ornis Fennica*, 12:107–121.

[27]1935. Einige Beispiele dauernde Veränderungen im Vogelgesange. *Beiträge zur Fortpflanzungsbiologie der Vögel*, 11:210–214.

[28]1936. Gesangsentartung bei Stadtvögeln. *Beiträge zur Fortpflanzungsbiologie der Vögel*, 12:12–14.

ECOLOGY

Effects of Rain and Drought in Southwestern Africa.[29]—A drought of several years was broken by heavy rains from October, 1933, to April, 1934; almost tropical vegetation appeared and insects increased enormously. Many species of birds laid larger sets during this rainy nesting season than the following dry one. In the three previous years the Wattled Starling (*Creatophora carunculata*) had been very rare and had never bred in this region, but great flocks arrived in the wake of the grasshoppers, and after these had laid their first eggs the Starlings began to build, raising two broods and feeding the young on the nymphs. The next year brought little rain and no egg-laying of the grasshoppers, nor building of the Starlings until the end of January. But the young grasshoppers were wiped out by a disease, and the Starlings let their young die of starvation, even though there were plenty of other insects. Many Ploceidæ, Sturnidæ, and Laniidæ started to build in the fall of 1934 upon the appearance of the first rains, but deserted their nests when no more rains fell.

[29]Hoesch, W. 1936. Nester und Gelege aus dem Damaraland. II. *Journal für Ornithologie*, 84:3–20.

BIRD BEHAVIOR

"Social Behavior of Birds."—T. Schjelderup-Ebbe. 1935. In C. Murchison's "Handbook of Social Psychology," Clark Univ. Press. 947–972. The author has done pioneer work on the matter of despotism and peck-order in the domestic fowl, and it is a fine thing to have a summary of his studies in English. Very many of his observations are illuminating, not only in regard to the psychology of chickens, but of mankind as well. He makes the mistake, however, of applying his findings too widely, as Allee has shown, and as, indeed, will be evident to any careful student of the behavior of wild birds.

Polygamy in a Mute Swan.[30]—An interesting paper with considerable discussion of the psychology of breeding behavior in birds and mention of various instances of polygamy in normally monogamous birds. A male *Cygnus olor* in the

Zoölogical Garden at Amsterdam took no share in incubation, but occupied his leisure in acquiring an extra mate, which built a nest only nine meters from that of the first mate.

[36]Portielje, A. F. J. 1936. Ein bemerkenswerter Grenzfall von Polygamie bzw. accessorischer Promiskuität beim Höckerschwan, zugleich ein Beitrag zur Ethologie bzw. Psychologie von *Cygnus olor* (Gm.). *Journal für Ornitholog ie*, 84:140–158.

BOOKS

Distribution of the Breeding Birds of Ohio.—Lawrence E. Hicks. 1935. Ohio Biol. Survey Bull. 32. Columbus. pp. 125–190. 75cents.. In this unique bulletin a map of Ohio is given in which the number of breeding birds known from each county is shown. The status of each of the 181 forms recorded is considered, details being given as to the distribution of those found in all eighty-eight counties, while at the end are listed the two hundred twenty-four species known to breed in Ohio and the surrounding States. This publication represents an extraordinary amount of well-planned work, both by the author and a large number of other bird-students, and will certainly stimulate further work in Ohio, as well as serving as a model for similar undertakings in other States. Such a project presents a fascinating object for local ornithological endeavor, and has the larger value of serving as a foundation for studies on the ecological requirements of each species and the underlying causes of distribution. Finally, such knowledge is indispensable if we are going to *manage* animal populations intelligently, and care for our wild-life resources in such a way as to "result in perpetual conservation."

The Juvenal Plumage and Postjuvenal Molt in Several Species of Michigan Sparrows.—George Miksch Sutton. 1935. Cranbrook Inst. Science, Bull. 3:1–36. This scholarly paper shows how little has been known in regard to the juvenal plumages and molts of some of our commonest birds. And although descriptions are given here of eleven species (including Cardinal, Indigo Bunting, and Red-eyed Towhee), as well as eight beautiful colored plates from paintings by the author, yet Dr. Sutton makes it plain how many problems remain unsolved. For instance, how long is the juvenal plumage worn? I heartily commend this bulletin to all banders who have the opportunity of capturing young birds, for such people can add substantially to our knowledge with this paper as a guide.

Bird Portraits in Color.—T. S. Roberts. 1934. Univ. Minn. Press, Minneapolis. Quarto; 206 p. Cloth, $3.50; limp cloth, $2.50; plates alone, $1.50. The colored plates by Brooks, Sutton, and others that appeared in "Birds of Minnesota" have been reissued with an abbreviated text telling something of field characters as well as the status of the birds throughout their range, so that this book serves as an illustrated manual for the northern United States east of the Rockies. It will be particularly helpful to bird-students in the Mississippi Valley, illustrating as it does a number of Middle Western species that are omitted from the plates of birds of Eastern States. Both plates and text can be highly commended.

Bird Flight.—Gordon Aymar. 1935. Dodd, Mead. N. Y. 234 p. $4.00. The two hundred splendid photographs gathered from a great many sources constitute the *raison d'etre* of this volume. It would have been better to have let them stand alone and omitted the text, which is put together, entirely uncritically, from a miscellaneous set of books, many of them out of date. The author has not consulted the recent and most authoritative writings on his subject (for instance, K. Lorenz, *Journal für Ornithologie*, 1933), and even on the matter of aërodynamics, his theories are incorrect. It is a pity that such a handsomely got up book, with such superb illustrations, should prove a false guide to the many who will buy it.

Dwellers of the Silences.—Alexander Sprunt, Jr. 1935. (1st ed. 1928). Dodd, Mead. N. Y. $2.50. The heroes of these stories are herons, swans, owls, a raven, eagle, turtle, wolverine, and others. The author succeeds in arousing enthusiasm for, and a protective interest in, the wild creatures and at the same time avoids surprisingly well the pitfall of anthropormorphism. His stories would have a wider appeal, especially to children, who constitute his largest potential audience, if his descriptions were shorter and his language simpler.

Oceanic Birds of South America.—Robert Cushman Murphy. 1936. 2 vols. American Museum of Natural History, N. Y. Qto. 1245, p. $10.50. To the stay-at-home bird-student, these wonderful volumes open vistas of new and unknown lands with strange and fascinating birds. They are a monument to the zeal and tireless labor of the author, of the "Field Worker," Rollo H. Beck, and the artist, Francis Jaques, and besides they are a joy to look at and a delight to read.

Broad geographical and ecological factors are treated in the preliminary chapters on meteorology and hydrology, dealing with ocean currents, winds, rainfall, and hurricanes. In "The Nutritional Basis of Marine Life" we learn that "water temperature, rather than air temperature, may be said to govern the distribution of sea birds," and that "diatoms are the connecting link between the energy of the sun and the oceanic animal world, including birds" (page 62). Low temperature and the accompanying low salinity "in the southern oceans make for an abundance of life far in excess of that found in warm sea water," partly because the longevity of cold-blooded animals is much greater at cold than at warm temperatures (Loeb, 1908).

Two hundred and ten pages are devoted to a most valuable "Ornithological Circumnavigation of South America," describing the shoreline and islands even as distant as St. Helena, the Galapagos, and the American quadrant of Antarctica, and giving geographical and faunal details. This narrative is of great interest and variety, but a sad thread runs through most of it, for almost everywhere man has despoiled nature, either by direct killing or by the introduction of his satellites—rats being one of the greatest enemies to nesting seabirds. An interesting observation was made by the author as to the fauna of the Galapagos: "Introduced mammals living in a completely feral state include cattle, horses, asses, hogs, goats, and dogs. The last are highly destructive to the native fauna." The wildness of these descendants of domesticated animals "contrasts amazingly with the utter confidence and lack of sophistication shown by nearly all the autocthonous animals."

The life-histories of the 185 species and subspecies prove of absorbing interest. Penguins are popularly regarded as particularly "intelligent" creatures, but Dr. Murphy judges "that they become conditioned to new stimuli much less readily than the majority of higher birds," and that unfamiliar situations "present problems which they solve slowly if at all," their obstinancy in following original yet unsuitable routes over the ice "even though better and safer paths lie directly under their eyes," being a case in point. An interesting suggestion is given in regard to the "hooligan" Adélie Penguins (*Pygoscelis adeliæ*) described by Levick: "If such rogue penguins are assumed to be unmated birds in a great flock composed mainly of couples with reduced outside contacts, their behavior can be interpreted as that of individuals which have not been able to sublimate their pugnacious and dominating urge, which is at one stage a necessary element in the courting and mating pattern" (page 339).

In the matterof parental care, penguins show an astonishing variety of different behavior patterns. With the Emperor Penguins (*Aptenodytes forsteri*) only a few birds lay during one season, but all wish to brood and will fight for the privilege. "So avid and blind, indeed, is the interest of parents and foster parents alike in eggs and chicks that the resulting struggles work entirely gratuitous hardship upon the offspring, many of which are literally killed by kindness" (page 360). King Penguins (*Aptenodytes patagonicus*) are much more conventional in their behavior: "After the chicks are large enough to be left alone, a control-mechanism common among colonial seabirds tends to keep them from going astray. This is the reaction which impells every brooding adult to jab and strike at any chick within reach except its own" (page 351). The Gentoo Penguins (*Pygoscelis papua*), although rearing their young at first in this individualistic manner, later go "communistic," the chicks congregating together "always under the guard of adult nurses," which "dashed at any skua that alighted near-by," while other adults "transported bellyfulls of food which, presumably, was no longer intended for their own particular offspring" (page 379).

When the chicks of the Wandering Albatross (*Diomedea e. exulans*) are some four months old, "something happens which is so extraordinary and spectacular that the early accounts of it found little credence, although we now know that it is paralleled in greater or less degree among all Procellariiform birds. With the setting-in of the Antarctic autumn, the adult albatrosses completely abandon their nestling offspring, not for a matter of days or weeks, but forever. Off on their Odyssean wanderings go the old birds, leaving the obese, well-muffed youngsters sitting on the trampled tops of their nests, where they remain quietly no matter how the wind howls or the snow beats down upon them. . . . For three months or longer the young albatrosses receive no visits from the adults and subsist entirely without food. Toward the end of this time, they begin at last to amble down off their nests and to try their legs and afterwards their wings." (page 560).

The quotations will give an idea of the wealth of valuable material in the biographies, and it is a matter of regret that limitations of space forbid telling of the Giant Fulmars, the Mutton Birds, Guanays, Blue-footed Boobies, the Skuas, and many others.

Dr. Murphy's book is a treasure trove of information in the fields of geography, ecology, and bird behavior, and will prove a guide to a better understanding of the ways of the little-known birds of the sea.

(Reviews by Thomas T. McCabe)

Animal Life in Palestine. F. S. Bodenheimer. 1935. Jerusalem, L. Mayer. v-506-i. This volume, a product of the Hebrew University at Jerusalem, contains excellent chapters on animal ecology, and a good chapter on the distribution of the birds, but the former are not brought into very direct bearing upon the latter. In regard to the higher vertebrates we are led to expect, rather than told, that the author inclines to a belief in the effectiveness of basic physical factors acting directly, rather than upon secondary agencies such as the character of the vegetation. Obviously in such a land "the precipitations are a limiting factor of paramount importance for plant distribution," but it is not quite so clear a generality that "the most important climatic factors which influence animal mortality are the combination of temperature and humidity." Kendeigh, for example, has recently suggested a different combination. Palestine, like California in various respects, including its geographic position in relation to two continents, is a land of spectacular life-zones, but nothing like rationalized zonation or precise ecological dissection is suggested. The theory of modern ecological research is admirably understood but not wedded to description of country or of vertebrate distribution. The latter is analyzed on a purely faunal basis into classical "subkingdoms" and "regions" with local subdivisions called "territories," which are briefly described in very general terms. Perhaps in no spot on earth can this be done more effectively, for through the narrow land pass side by side the faunas of three "regions," narrowed and crystallized into contrast, and surrounded islands or "enclaves" of two others. The result is a known total of some 413 bird forms, which is very large if we consider the small area, the lack of high mountains or a real forest belt, that exploration is hardly complete, and that the science of nomenclature has as yet by no means done its worst.—T. T. McC.

A Life History of the California Quail, with Recommendations for its Conservation and Management. Part I. E. Lowell Sumner, Jr. 1935. California Fish and Game, XXI, 3. This is a compact mass of evenly distributed information, the product of three years of watching, collecting, and examining wild birds and of watching birds under wire and under seminatural conditions. No one, I believe, has put so many first-hand facts about a living animal into a smaller space, and with this economy goes a sense of judgment and choice.

As a result of an economic objective, the paper opens with intensive studies of food, based on stomach analyses and carried out by the author himself at the cost of much time and labor. It is singular how small a part of modern studies of life-

history the great public and private food-records of this sort have played. Even here in the interesting later paragraphs on factors of suitability and unsuitability of foods and on general ecological requirements it is notable how little use can be made of the long botanical analyses, though in the second or purely economic part of the paper, not reviewed here, there is a list of desirable food plants. The water requirement of Quail in the West is a subject of perennial controversy. These studies were not made in a desert, but in a country burnt brown for many months, and the long seasons of use or absolute disuse of free water correlate precisely with absence or presence of succulent green vegetation. As to more general ecological requirements, "so long as suitable food, cover, and water are present the California Quail is able to live with equal facility [?] in all regions from the humid coast belt to the margins of the deserts"—of course, to be understood, within the main range, but which, if any, of these or other factors delimit the range itself, is only casually touched upon, with suggestions, on different boundaries, of drouth and snow. Vocal calls are numerous, often of unusually narrow significance, and admirably analyzed. The best paragraphs in the paper deal with "imitativeness as a basis for mass action" and various forms of coöperative, if not altruistic, behavior. In consideration of breeding and of covey formation and range the word territory and its concepts are rather studiously avoided. The covey composition is not very permanent, the "homing instinct" weak. "The covey is analogous to a river, which constantly maintains itself, although the individual drops of which it is composed continually pass onward." Not much information was obtainable as to reasons for nest failures, evidently some sixty per cent on the average. Food supply and drouth are evidently far more important factors for later mortality than natural enemies, at least under normal conditions.

It is only when we draw breath after the frequently brilliant treatment of so many details that we become conscious of a sense of suspension—of a lack of anything to grapple with or follow up, a sense for which the conditions of the undertaking, not the author, is responsible.

The conception of such a plan lies in the idea that science consists in examining the matter of a problem so completely that one can list all its attributes once and forever, so that, in whatever controversy or investigation it may become involved, the parties interested need only dip into this full reservoir and take out the required information. Now, no one is ever going to list all the facts about a bird's life, any more than he is going to describe all the variations of a species of bird, insect, or plant, and label them with tri-, tetra-, or pentanomials, or collect all the information about human beings, so as to make it unnecessary for anyone ever to write another volume of psychology or another novel. It would seem a truism to say that research has value just in so far as it has an object, but in practical application, especially in the vertebrate field, this is not a truism but a most obscure departure.

The weakness of the paper lies in its conscientious symmetry. If the author had correlated a more minutely analyzed physiological cycle with an exhaustive investigation of the macro- and micro-climates of the habitat, we might have approached an understanding of the environmental control of the cycle. If pursuit of the ecological requirements further afield and marginally had only run away with the paper and been tied into the rich physical data available for the range in question, or into considerations of recent geologic history, we might be initiated into some of the mysteries of distribution. If the author had stolen time to follow up his finely intuitive hints and leads as to the mind-story and its place in the variegated series of mental types among birds, we might achieve something like a subjective grasp of the bases of Quail behavior.

But Mr. Sumner was under orders from a State agency to work out the complete life-history of the California Quail for economic purposes, and when the word economic comes in at the door such opportunities fly out at the window. What a pity it was not an ornithologist instead of a mathematician who proposed the immortal toast "Pure mathematics, and eternal perdition to whomsoever . . ." etc., etc.—T. T. McC.

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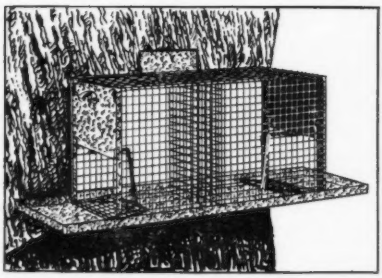

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